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MELBOURNE

THE TABANIDAE (DIPTERA) OF AUSTRALIA

III. SUBFAMILY PANGONIINAE, TRIBE SCIONINI AND SUPPLEMENT TO PANGONIINI

By I. M. Mackerras*

[*Manuscript received July 20, 1959*]

Contents

Page
Summary 1
I. Introduction 2
II. Tribe Scionini 2
III. Genus *Scaptia* 3
  Evolution and relationships 3
  Habits 7
  Life history 9
  Distribution 11
  The problem of speciation 19
  Classification 32
IV. Subgenus *Scaptia* 36
V. Subgenus *Pseudoscione* 81
VI. Subgenus *Myioscaptia* 122
VII. Subgenus *Plinthina* 131
VIII. Subgenus *Palimmecomyia* 142
IX. Tribe Pangoniini 145
X. Excluded species 148
XI. Acknowledgments 148
XII. References 148
Index of Generic and Specific Names 151

Summary

The Australian Scionini belong to five subgenera of the genus *Scaptia*, namely: *Scaptia*, known from South America and Australia, with 28 Australian species; *Pseudoscione*, known from South America, Australia, New Guinea, and New Zealand, with 25 Australian species; *Myioscaptia* (7 species), *Plinthina* (7 species), and *Palimmecomyia* (2 species), known only from Australia.

Many of the species suck blood, but some appear to feed only on flowers, chiefly of *Leptospermum*. Larvae and pupae of one species each of the subgenera *Scaptia*, *Pseudoscione*, and *Myioscaptia* are known.

The principal concentration of species is in eastern New South Wales, with radiation north and south, and subsidiary concentrations in north Queensland and south-western Western Australia. The subgenus *Plinthina* has developed mainly in Western Australia. The Pleistocene glacial cycles are believed to have had a profound effect on speciation in the genus.

* Queensland Institute of Medical Research, Brisbane.

The following new species and subspecies are described in the respective subgenera:

Scaptia: barbara, ♂ ♀, N.S.W., S. Qld.; *norrisi,* ♂ ♀, N.S.W., N. Qld.; *aurinotum,* ♀, N.S.W.; *minuscula,* ♂ ♀, W.A.; *auranticula,* ♂ ♀, W.A.; *orba,* ♀, N.S.W.; *alpina alpina,* ♂ ♀, N.S.W., Vic.; *alpina hardyi,* ♂ ♀, N.S.W.; *similis,* ♂ ♀, N.S.W., Qld.

Pseudoscione: orientalis, ♂ ♀, N.S.W., Vic.; *guttipennis occidentalis,* ♂ ♀, W.A.; *calabyi,* ♂ ♀, W.A.; *neoconcolor,* ♂ ♀, N.Qld.; *anomala,* ♂ ♀, N.S.W., Vic.

Myioscaptia: calliphora, ♂ ♀, N.S.W.; *nigrocincta,* ♀, N. Qld.; *nigroapicalis,* ♂ ♀, N.S.W.

Plinthina: nigerrima, ♀, N.S.W.; *subcinerea,* ♂ ♀, W.A.

Palimmecomyia: pictipennis, ♀, S. Aust., ? W.A.

Scaptia (*Scaptia*) *monticola,* nom. nov., is proposed for *montana* Ricardo nec Hutton.

Two species are added to the Pangoniini: *Ectenopsis* (*Ectenopsis*) *erratica* (Walk.), ♂, W.A., previously unrecognized; and *Caenoprosopon dycei*, sp. nov., ♂, N.S.W. *Ommia prisca* End. is transferred from the synonymy of *Ectenopsis* (*Parasilvius*) *victoriensis* Ferg. to the synonymy of *Mesomyia* (*Lilaea*) *lurida* (Walk.), Chrysopinae.

I. INTRODUCTION

There are striking differences between the two tribes of Pangoniinae in Australia. The Pangoniini are evidently a relict fauna made up of comparatively few, rather obscure and uncommon species, which can be divided into clearly defined genera and subgenera (Mackerras 1956*b*). The Scionini, on the other hand, are represented by a single, successful genus, *Scaptia*, which has radiated widely through the country, and evolved into a large number of species. Many of them are locally very abundant, and they form, collectively, a conspicuous faunal element, which has long been known to Australian entomologists under the old misapplied names *Pangonia*, *Erephopsis*, and *Diatomineura*.

Ferguson (1924, 1926*a*) clarified the generic synonymy, and he also elucidated many of the species described by earlier authors; but he did not reach the stage of constructing keys for their recognition, nor had he seen more than a few of the new forms that are now before me. His work laid the foundation for the present revision.

It has not been easy to present an account of nearly 70 species in a way that will enable future workers to identify them in the field with reasonable confidence; but the work has been greatly helped by the abundant material (more than 500 males and nearly 3000 females) that has been available for study, and by a recent opportunity to examine type specimens in institutions abroad. As a result, no described Australian species of the subfamily now remains unrecognized.

New references are listed at the end, but most of those cited in this Part are included in the bibliography in Part I (Mackerras 1956*a*, pp. 401–7).

II. Tribe SCIONINI

Style of ♂ hypopygium single, usually finger-like, sometimes hooked and pointed. Eyes almost always hairy. Third antennal segment subulate, with 8 (rarely

7) annuli. Palpi almost always dimorphic in the sexes. Hind tibial spurs moderately long, slender. Vein R_4 usually without appendix.

There is only one genus in Australia.

III. Genus SCAPTIA Walker

Type species, Australian synonyms, and taxonomic references will be listed under the subgenera, but four names, which have been used more widely or more loosely, may be noted here:

Osca Walker, 1850. A subjective Neotropical synonym of the subgenus *Scaptia*; applies to the *lata* group of species, which is remarkably like the *limbithorax* subgroup in Australia.

Diatomineura Rondani, 1863. An objective synonym of *Osca*.

Erephopsis Rondani, 1863. An objective synonym of *Melpia* Walker, 1850, which is a subjective synonym of the Neotropical *Fidena* Walker, 1850.

Pangonia Rondani, 1863. A lapsus for *Pangonius* Latreille, 1802, the type of which is a Palaearctic species of the tribe Pangoniini.

Erroneous allotment of species to other genera, such as *Corizoneura*, will not be included in subgeneric synonymy, but noted under the appropriate species (see also Mackerras 1956*b*, p. 415).

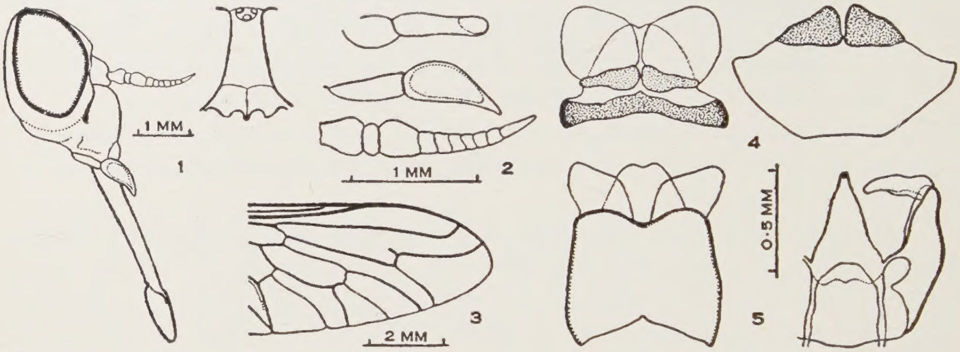
Usually stoutly built, tomentose, and hairy flies, with a longer, more slender proboscis than in other Australian Tabanidae; but a few species are not rotund, some are relatively bare and more or less shining, and the proboscis is generally quite short and stout in the subgenus *Scaptia*. Eyes well separated in ♀, meeting on most of frons length in ♂; upper facets of ♂ occasionally enlarged; hairs long, usually dense, easily visible at ×15, except in ♀ of *S.* (*Pseudoscione*) *roei* (Macl.); usually concolorous in life in both sexes, but occasionally bicoloured or ornately marked. Frons of ♀ diverging, parallel, or slightly converging, tomentose; with a rudimentary callus in *S.* (*Palimmecomyia*) *walkeri* (Newm.) only. Face truncate or moderately bulging. Mandibles fully developed in ♀. Legs slender, relatively long. Wings with vein R_4 usually sinuous, sometimes angulate, occasionally with appendix; cell R_5 open or closed; cell M_3 rarely narrowed or closed; cell Cu_2 always closed and short-petiolate; setulae on vein Cu_1 variable. Genitalia defined under the subgenera.

Most species of *Scaptia* can be recognized by their distinctive habitus, combined with hairy eyes, ocelli, 8-annulate third antennal segment, hind tibial spurs, and smooth, tomentose frons. Two genera of Pangoniini have a somewhat similar appearance, and may cause difficulty, if males are not available for dissection. *Austroplex* may be distinguished by its bare eyes, presence of a callus, and differently shaped antennae and palpi; *Ectenopsis* (*Parasilvius*) by the inconspicuously hairy eyes of the female and compacted third antennal segment; both by having a strong appendix on vein R_4.

Evolution and Relationships

The genus *Scaptia* is known from South America, Australia (including Tasmania and New Guinea), and New Zealand (Mackerras 1956*a*, Fig. 2). Oldroyd (1957, pp. 452–6) has shown that the records from Africa cannot be accepted. The genus has been divided into six subgenera (Mackerras 1955*a*), of which five, and an anomalous species, occur in Australia.

The earliest true Scionini were probably not unlike the small Australian species described below as *S. anomala*,* and they may be suspected to have evolved as part of a primitive tabanoid fauna, which was becoming adapted to feeding on nectar of the early flowering plants. The Neotropical *Scaptia* (*Pseudomelpia*) and the Nearctic *Goniops* are probably offshoots from this original stock, but its major primary division was into forms which would be included today in the subgenera *Scaptia* and *Pseudoscione*. It is tempting to think of this division as following a second change in feeding habits, the ancestors of the stockily built *Scaptia* being presumed to have taken to a blood-sucking mode of life earlier than those of the rotund but longer-limbed *Pseudoscione*.



Figs. 1–5.—*Scaptia* (*Pseudoscione*) *longipennis* (Ric.), Neotropical, subgenotype. 1, head and frons of ♀; 2, palp of ♂, palp and antenna of ♀; 3, wing of ♀ (angulate and appendiculate vein R_4 is unusual); 4, ♀ genitalia; 5, ♂ genitalia.

The essential characters of the subgenus *Scaptia* (stocky build, parallel frons in the females, short, thick proboscis, large labella, strong mouthparts, relatively long, laterally compressed palpi in the females, and rod-like palpi with flat apical bare area in the males) must have been established early, and they must have led to considerable adaptive stability, because the subgenus still forms a compact unit in South America and Australia.

The subgenus *Pseudoscione*, on the other hand, formed the matrix from which all the remaining diversity of the tribe evolved. It has a South American type species, and was accepted (Mackerras 1955*a*) as occurring also in Australia, New Guinea, and New Zealand, with the reservation that South American males had not been examined. I have now been able to study both sexes of the subgenotype and males of two other Neotropical species. Their genitalia (Fig. 5) are quite similar to those of Australian and New Zealand species, so any distinctions between the regional faunas would have to be made on external characters.

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* Names cited without author in the text are fully treated in the systematic part of the paper.

The "ancestral" form, *S. anomala*, has a diverging frons in the female, relatively short stout proboscis, large labella, and long, slender, fusiform palpi in both sexes, and is distinguishable from some primitive Pangoniini by little more than the genitalia. The first steps in differentiation are shown by the New Zealand *S. adrel* (Walk.) and its allies, which have the body more typically rotund, frons somewhat narrower, proboscis longer, labella smaller, and palpi more pointed, and narrower in the males than in the females. There is an almost continuous series, leading from these to the flat palpi of the females and *Scaptia*-like palpi of the males in other New Zealand species (Mackerras 1957, Fig. 3).

The trend in South America has been towards elongation of the proboscis, with associated reduction of the labella and snout-like prolongation of the face (Fig. 1). There is considerable variation in the palpi of the females, but those of the males examined (*longipennis*, *latipalpis*, *viridiventris*, and also males of *Fidena* and *Scione*) are uniformly *Scaptia*-like (Fig. 2).

Most Australian members of the subgenus have a wider, more obviously diverging frons and longer proboscis than their New Zealand relatives, but without the reduced labella or snout-like face of the South American species. The palpi of the females lead from the slender form of *S. vicina*, which links with the *anomala* type, to the small, thick, hollow palpi of the *maculiventris* subgroup. Those of the males lead from the rather *Scaptia*-like type seen in *S. subappendiculata* to a characteristic, stout, cylindrical form, with apical pit (Fig. 32). The Tasmanian *S. ianthina* may represent a closer link with New Zealand, but it is too little known to warrant discussion.

These recognizable regional faunas are all indubitably *Pseudoscione*, but the same stock has also given rise to five genera in South America and three subgenera of *Scaptia* in Australia. The latter are characterized primarily by genitalic specialization in both sexes, and their origin from the *Pseudoscione* component is indicated by tendency to a diverging frons in the females, relative length of proboscis and palpi, shape of the palpi in the females, body pattern in *Plinthina*, and usually closed cell R_5. They differ considerably from one another, but the common genitalic characters point strongly to divergence from a single ancestral species, and the *Scaptia*-like palpi of the males suggest that it had become genetically isolated early in the Australian history of the subgenus. The hypothetical evolution of the tribe is shown diagrammatically in Figure 6.

The chief developments in the Scionini would thus appear to have been in characters that are associated with the feeding habits of the adults (blood-sucking, or drawing nectar from flowers of different depths), and the stimuli producing them have evidently differed in the principal centres of evolution. There have been other specializations, too. Thus, the *clavata* group of *Pseudoscione* is distinguished by adaptation to an unusual oviposition site, possibly in soft sand, and the subgenus *Myioscaptia* mimics muscoid flies, while it and the other endemic Australian subgenera show genitalic modifications, of obscure adaptive significance, but striking in comparison with the uniformity of almost all the rest of the tribe.

There have been wider aberrations in South America, such as the dichoptic eyes of the males in *Mycteromyia* and the bizarre antennae of *Pityocera* and *Elaphella*,

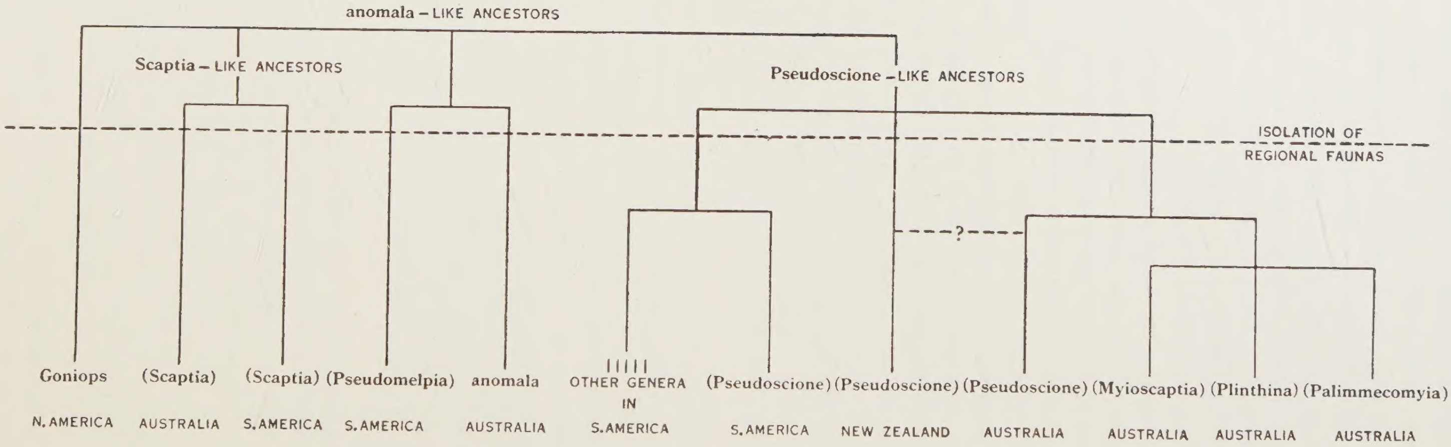


Fig. 6.—Scheme of possible evolution of the Scionini.

but no other clearly defined trends have been observed. The wing venation, in particular, has not provided the evidence of relationships that Enderlein (1922, 1925) and Kröber (1932) attributed to it. All that can be said is that cell R_5 is closed more often in the *Pseudoscione* line of evolution than in the *Scaptia* line; that it is unusually petiolate in the South American *Pityocera* and its allies and some Australian *Plinthina*; that cell M_3 is narrowed in part of the *guttata* group of *Scaptia* and a few *Myioscaptia*, and closed in *S. singularis* and the South American *Scione*; and that an appendix on R_4 seems to be of almost completely haphazard occurrence.

In summary, the Scionini of Australia, New Zealand, and South America clearly came from a common stock, and there has been vigorous adaptive radiation in the two larger countries, with a greater tendency to attain stability in Australia than in South America. It is impossible to guess which way the traffic may have gone; but evolution of rather more than the basic stocks of *Scaptia* and *Pseudoscione* in a temperate Antarctic continent and dispersal to all three countries is a logical hypothesis. Whether this was achieved by drifting continents, or by some other means, is a question that biological evidence cannot answer.

Habits

The females of most species have been collected when attempting to suck blood. Some are extremely shy, and one gets the impression that they are more eager in their attacks on horses or cattle than on human beings. These species will disappear in a flash, if disturbed, and will not return. Others are more persistent, and Ferguson and Hill (1922) recorded *S. subcana* as attacking bathers at Magnetic I., N. Qld., and *S. violacea* as plentiful on Palm I. in the same area. "Specimens were taken on the beach, on hillsides, in scrub-covered ravines, on open grassy flats, and in dwellings. They . . . keep near the ground, and show a decided preference for persons dressed in dark-coloured materials." *S. binotata* is a vicious and persistent biter in Western Australia (Calaby, personal communication), and *S. guttata* is recorded as attacking horses fiercely in the bush in New South Wales (Ferguson and Henry 1920), but most of the reports of Tabanidae as pests of man or stock are based on other genera. No species of *Scaptia* was included in the precipitin tests reported by Lee, Dyce, and O'Gower (1957) from New South Wales, and they did not observe any to be attracted to rabbits, nor did Calaby (personal communication) in Western Australia.

The low-level approach noted above seems to be rather characteristic of the subgenus *Myioscaptia*. It was very striking, at Binna Burra in south Queensland, to observe *S. similis* hurtling noisily round one's head, and alighting, if at all, on the upper part of the body, whereas *S. bancrofti* landed unobtrusively on the shoes or ankles, and was often felt before it was seen.

The effect of the puncture varies from a sharp, somewhat burning prick to an unpleasantly painful stab. Sensitization has not been recorded. Most species settle firmly on the body, when biting, but Dyce (personal communication) has described a more vigorous attack by *S. xanthopilis*, which he observed at Colo Vale, N.S.W.:

> "I took the opportunity to watch one breaking through human skin. After placing the stylets in position, it appeared to release hold with its hind pair of legs, and with very rapid vibration of the wings virtually drive into the tissue."

This is reminiscent of the method of attack described by Mitter (1918) for *Philoliche longirostris* (Hardw.) in India.

The females of some species—notably *S. maculiventris* in the southern highlands of New South Wales—seem to divide their attention between blood-sucking and feeding on the nectar of flowers, but a few, of which *S. patula* is the commonest, do not appear to suck human blood at all. I would have said the same of *S. auriflua*, but Lee, Dyce, and O'Gower (1957, Table 10) list it as feeding on man at Colo Vale.

Leptospermum blossoms are the most favoured haunts of the flower-feeding species in eastern Australia, and a brief description of this habitat has been given in Part I (Mackerras 1956*a*, p. 390). Fuller (1936) has given a more detailed account of the behaviour of the southern form of *S. patula*:

> "In January, 1935, the flies were plentiful on *Leptospermum* flowers on a small plain at the foot of Mt. Coree. . . . The flies remained resting or moving about on the flowers for considerable periods, and were not readily disturbed. They frequently rested beneath the flower clusters and among the inner parts of the bushes, with their lower surface uppermost, and were then not readily distinguishable in spite of their bright colouring. Both sexes were present in equal numbers."

Males, in general, have been taken feeding on flowers, hovering like Nemestrinidae over bare, sunny patches, or resting on low shrubs in swampy places.

Mr. Calaby has given me the following notes of his observations in Western Australia, where there is a greater variety of wild flowers than in the east:

> "The great majority of flowers visited belong to the Myrtaceae. *Leptospermum* appears to be one of the most popular plants, *Melaleuca* also, to some extent, and I have occasional records for Myrtaceae of other genera. I have an early spring record of *Scaptia* on *Grevillea* flowers. The flowering shrubs visited were mostly in low spots, and were always short, no higher than 2 feet. The flies were generally resting quietly on the flowers, or sometimes walking over the racemes, probing here and there. *Scaptia* seems to be most common somewhat later in spring than the main wild flower season. However, the Myrtaceae generally are still flowering well into summer, particularly in the low spots. The flowers which appear most attractive to *Scaptia* are also the ones which are best for collecting other flower-haunting Diptera, e.g. apiocerids and nemestrinids."

He noted that tabanids, including *Scaptia*, were also often seen resting on bare sand in the sand-plain areas and on fire-blackened logs in jarrah country. On Rottnest I., which has an impoverished flora, *Scaptia* and other flower-haunting insects were found on the "Rottnest daisy" (*Didiscus coeruleus* D.C., Umbelliferae).

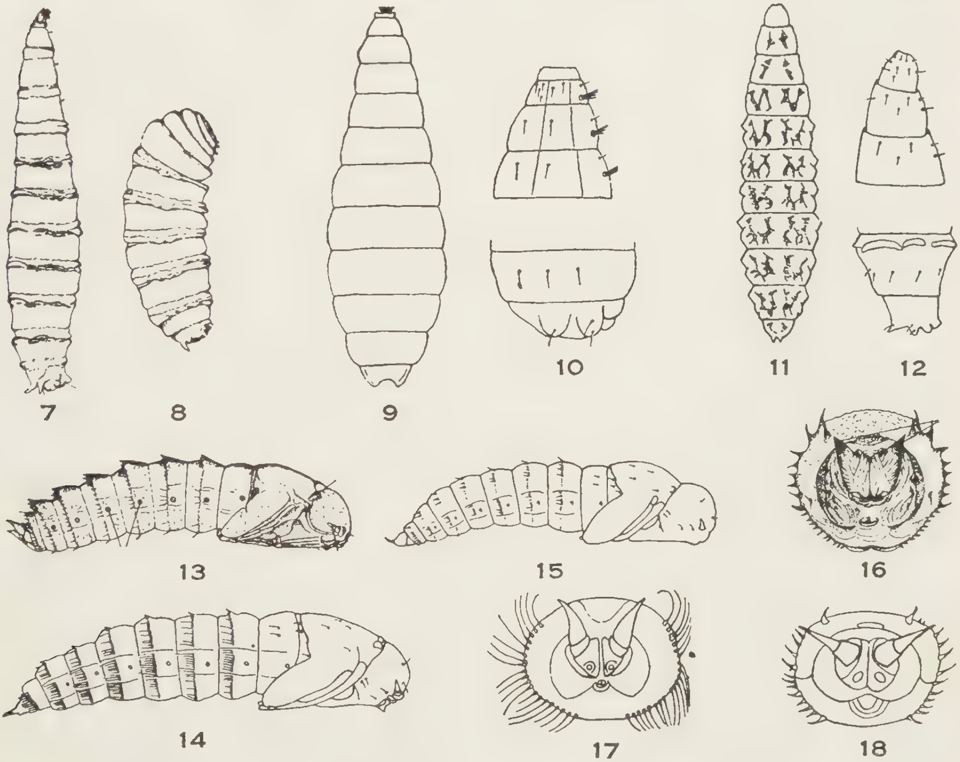
All the species seem to be most active on sunny, humid days with little wind. The best collecting time on flowers is between 10 a.m. and 3 p.m. in midsummer, and the flies usually disappear when the sun is hidden by clouds, but come out again as soon as it reappears. Blood-sucking species, however, will often bite freely in forest shade, and occasionally at dusk in the evening.

The only other striking aspect of behaviour is a tendency to mimicry. Both species of *Palimmecomyia* give the impression of being general wasp mimics, but nothing is recorded of their habits. On the other hand, there is no doubt that the species of *Myioscaptia* both look and act like blowflies. Nicholson (1927, p. 57) has discussed two of the species, his "*Scaptia* sp. near *gibbula*" being *S. calliphora* described below:

> "A different type of possible mimetic resemblance is shown by certain . . . tabanids. Several species possess a considerable resemblance to blowflies. Thus *Scaptia violacea* (Pl. i., fig. 99)

is metallic blue like many blowflies, such as species of *Chrysomyia*, and *Scaptia* sp. (near *gibbula* Walk. Pl. i., fig. 97) closely resembles the common *Calliphora stygia* Fabr. in its dull brown colour and golden pubescence. Both species are rather abnormal in shape for tabanids, this approximating very closely to that typical of blowfles. . . . That mimicry is involved in the resemblance, however, is indicated by the habits of *Scaptia* sp. Tabanids and blowflies each have very characteristic habits, and an experienced entomologist can readily distinguish one from the other, either by the sound it makes or its movements when flying. Each produces a different sound and, while tabanids exhibit a certain purposefulness in their manner of settling on an animal, settling as soon as an opportunity is presented, blowflies buzz round in an aimless fussy manner and appear to settle almost by accident. *Scaptia* sp. exhibits exactly this aimless manner of flight and the sound it produces closely resembles the note of a blowfly. . . . On one occasion a number of these tabanids buzzed round us for several minutes before we discovered the deception."

It may be added that northern specimens of *S. bancrofti* are remarkably like *Calliphora nociva* Hardy, which extends considerably further north than *C. stygia.*



Figs. 7–18.—Larvae and pupae of *Scaptia:* 7, 8, 13, 16, *S.* (*Scaptia*) *patula* (Walk.), lateral views of extended larva, contracted larva, pupa, end view of aster; 9, 10, 14, 17, *S.* (*Pseudoscione*) *vicina* (Tayl.), dorsal view of larva, lateral views of its anterior and posterior ends, pupa, aster; 11, 12, 15, 18, *S.* (*Myioscaptia*) *muscula* Eng. Figs. 7, 8, 13, 16 from Fuller (1936), remainder from English (1955), by permission of the Linnean Society of New South Wales.

Life History

Oviposition has not been observed, and the eggs have not been found in the field, but the larvae and pupae of three species have been described, representing the subgenera *Scaptia*, *Pseudoscione*, and *Myioscaptia*.

S. patula was the first, described by Fuller (1936) under the name *S. auriflua*, with which it was then confused. Actually, her material was almost entirely the southern race of *patula*, only the few specimens recorded from Mittagong being true *auriflua*.

The larvae were found in considerable numbers, and in various stages of growth, in somewhat damp, grass-covered soil on a restricted area of a shallow mountain valley. They occurred just below the surface, often well up among the grass roots, in company with tipulid and some stratiomyiid larvae. They were not found in the wetter ground. They were pale yellowish in colour, with a pattern of chocolate to purplish brown pigment showing through the transparent, striated cuticle, and were elongate and rather leech-like in shape when active, but contracted to a short, barrel-like form when disturbed (Figs. 7, 8). Full-grown larvae measured about 25 mm.

They lived well in captivity, and did not attack one another, but fed readily on earthworms, and probably also on tipulid larvae. They would withstand starvation, and drying and hardening of the soil, for at least 6 weeks. Under these conditions they became contracted and darkened, but extended to their normal form when placed in moist soil and given food. The prepupal period, after feeding ceased, was 54–65 days, and the pupal period 15–24 days, full-grown larvae collected in October emerging over a period of three weeks in December and January. As larvae of various sizes were found together in the field, and growth in captivity was slow, and as the adults were only on the wing for a short period in summer, it was suggested that the full life cycle may require two, or possibly three, years.

English (1955) has described the larvae and pupae of *S. vicina* and *S. muscula*. Only two larvae of *S. vicina* were found, one in soil too dry to harbour tipulid larvae, and the other under a raked-up heap of decaying leaves and grass in the same area. They were longer (about 30 mm) and stouter than the full-grown larvae of *S. patula*. One fed on pupae of *Ephestia* (Lepidoptera) and a tipulid larva. Both adults emerged in February.

More than 30 larvae and pupae of *S. muscula* were found in a most unexpected situation—in company with ant-lion larvae in fine, dry sand on the floors of small caves and overhanging ledges in sandstone cliffs. The larvae were somewhat smaller than those of the other species, more flattened, and with more evident lateral pseudopodia. They lived well in captivity, and fed fairly readily on *Ephestia* pupae. The adults emerged in October and November. The duration of the life cycle is evidently variable, some of the larvae producing adults within a year, others not until four years after they had been collected (English, personal communication).

The distinguishing features of *Scaptia* larvae are: their shape; long, slender, blade-like distal part of the maxilla; prothoracic annulus partly or wholly covered with scales armed with backwardly directed spines; absence of a siphon; and obscured Graber's organ. The most striking feature of the pupae is reduction of the aster to two large lateral arms, the dorsal and ventral pairs being no more than insignificant tubercles. The rima of the thoracic spiracle is semicircular; 1st abdominal segment without pleural setae; spines on tergites 3–5 in a single row; and row of spines on 8th segment not divided into combs (English, personal communication).

Miss English did not discuss interspecific differences, but the illustrations (Figs. 7–18) and notes she has recently sent me suggest that the larvae may be distinguishable by differences in the ventral setae, as well as in size and shape, and the pupae by differences in abdominal pattern, chaetotaxy, and shape of the spiracles. The sheath of the proboscis is longer in the pupae of *S. vicina* and *S. muscula* than in those of *S. patula*, but this simply reflects subgeneric characters of the adults. I can find no differences between Miss Fuller's pupal shells of *S. auriflua* from Mittagong and those of *S. patula* from Blundell's, A.C.T.

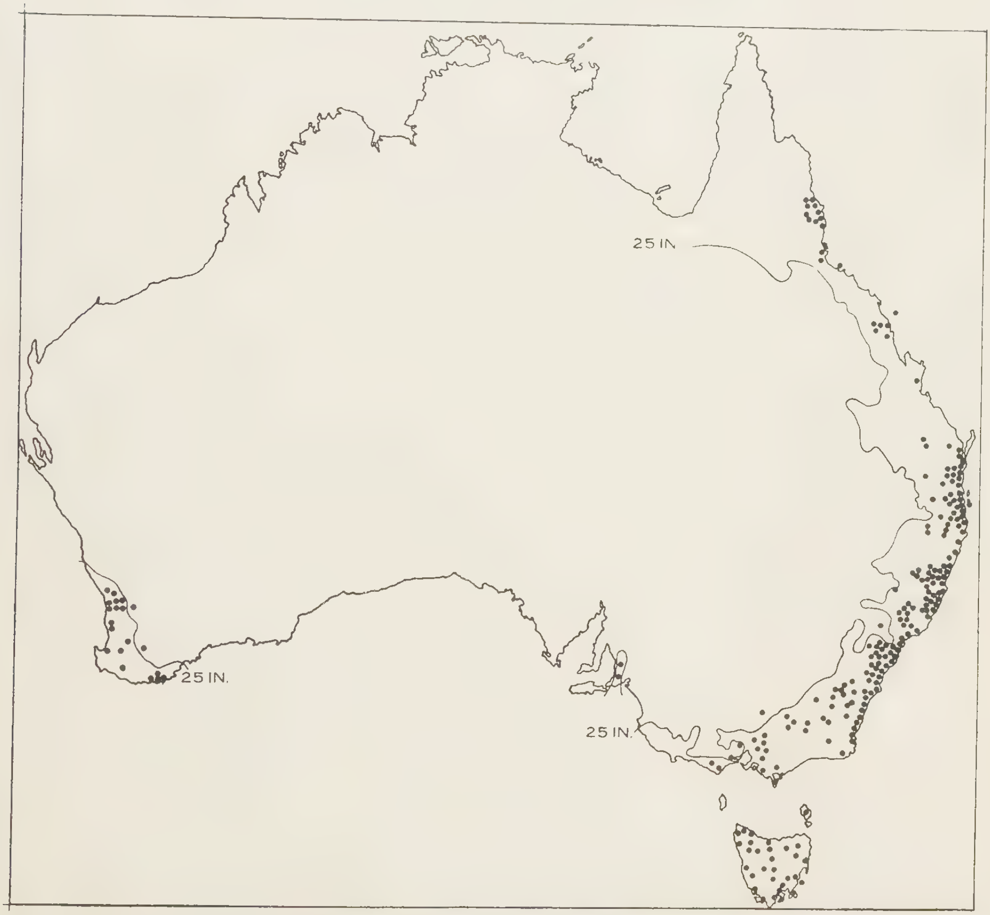


Fig. 19.—Distribution of the subgenus *Scaptia*. Each spot represents occurrence of one species within the area enclosed by 1° of latitude and longitude.

Distribution

The first problem in any study of distribution is to test the adequacy of one's data, for it is easy to draw wrong conclusions. The mosquitoes are a good example, an astonishing number of "tropical" species having been found in southern New South Wales and Victoria since the workers on myxomatosis and encephalitis began to study them intensively. *Scaptia* has been collected more assiduously than most

Diptera, and the 3500 specimens examined give one initial confidence in the plotted distributions. Conversely, its absence from such tropical areas as the Northern Territory and north-western Australia can be inferred with fair probability, because the men who collected the many hundreds of Chrysopinae and Tabaninae I have seen from those areas would not have failed to preserve specimens of *Scaptia* if they had seen any.

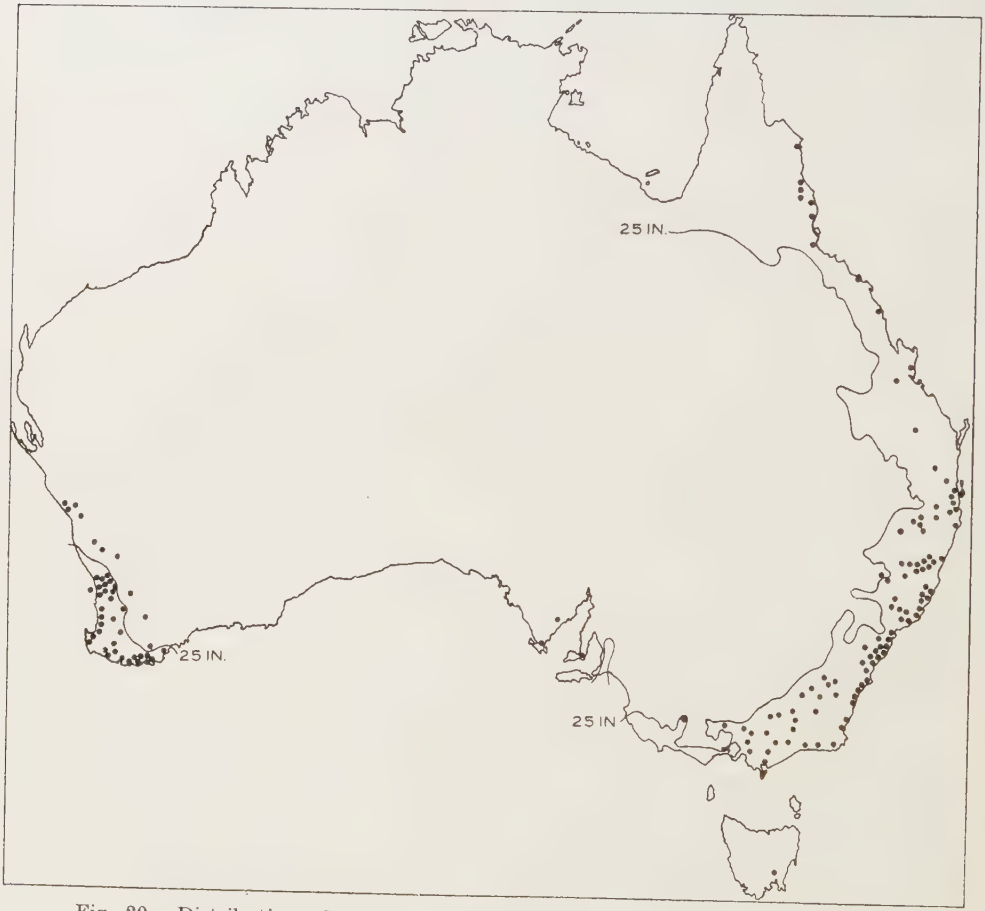


Fig. 20.—Distribution of the subgenus *Pseudoscione*. Values as in Figure 19.

In Figures 19–22, each spot represents the occurrence of one species within the area enclosed by 1° of latitude and longitude. Records about which there is material doubt have been omitted, but all others known to me are included. There are two reasons for the somewhat mottled appearance of the maps. One is that the suitability of the environment varies; but probably the more important reason is that some areas have been collected more intensively than others. Particular localities, such as Kuranda and the McPherson Range in Queensland, the Dorrigo Plateau, Barrington Tops, the Blue Mountains, and Mt. Kosciusko in New South Wales, and several in Victoria, have long been known as "good collecting places", and consequently have been visited repeatedly. Others, such as the Townsville district, Eidsvold, Camden Haven, the Sydney district, and the Australian Capital Territory, have had entomologists interested in the Tabanidae living in them for long periods. These patches of intensive collecting would introduce bias if the records were used for analysis of small areas; but, from the present point of view, they are well distributed along the whole of the east coast of Australia. C.S.I.R.O. workers and others (e.g. White, Hardy, Ferguson, Nicholson) have also collected extensively in Tasmania and Western Australia, and there is an active group of entomologists in South Australia. There are undoubtedly gaps to be filled, and ranges to be extended; but it does seem probable that bias in collecting has not introduced major fallacies in broad comparisons from north to south and from east to west.

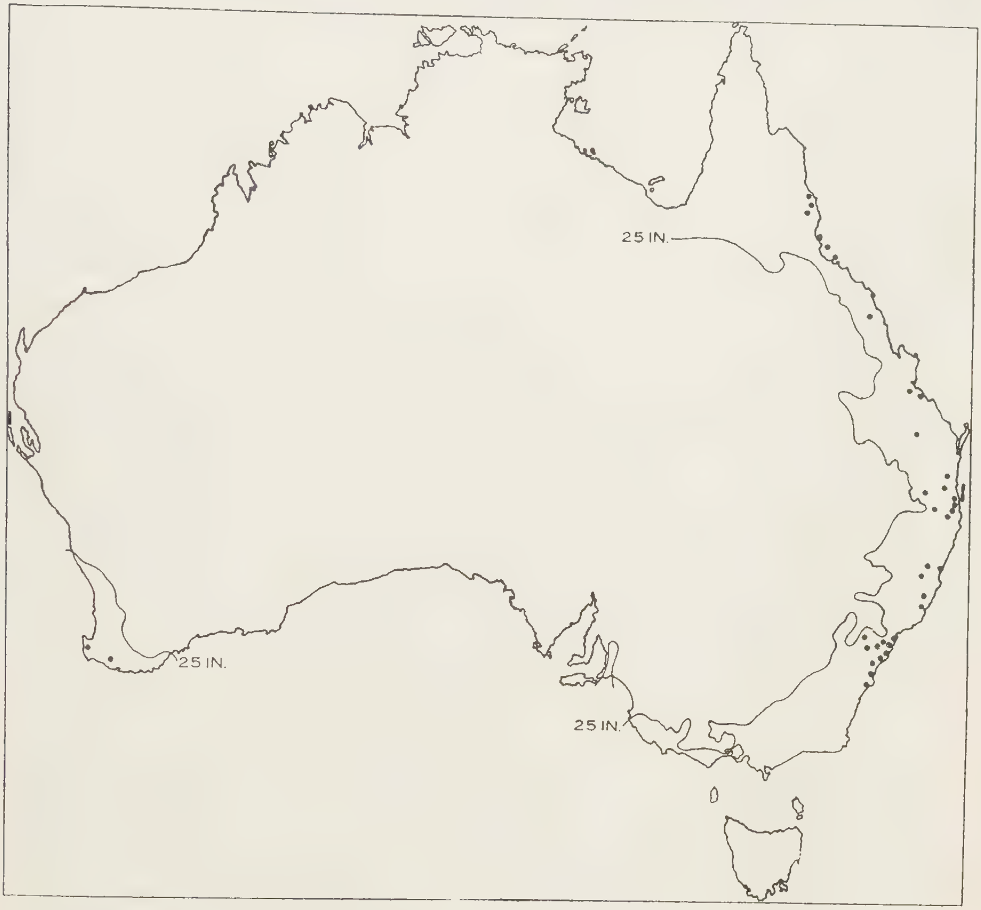


Fig. 21.—Distribution of the subgenus *Myioscaptia*. Values as in Figure 19.

Abundance cannot be plotted in the same way. Entomologists usually collect all the species that they see, but only a sample of the individuals, and there is no consistency in methods of sampling. Consequently, the number of specimens from an area is, at best, a crude measure of local abundance, although the totals listed under the species in the systematic part of the paper do provide a useful indication of those that are common and those that are not.

Subgenera Scaptia, Pseudoscione, *and* Myioscaptia

In 1925, I wrote of the nemestrinid genus *Trichophthalma*, which also belongs to the "Antarctic" element in the Australian fauna:

> "The evidence strongly indicates that the centre of recent development of the genus is in eastern New South Wales, whence it has spread to Banks Island in the north, to Tasmania in the south, and also to the south-western corner of Western Australia."

An essentially similar situation is found in the three subgenera to be examined here. The general position is shown in Figures 19–21 and the upper part of Table 1, and supporting evidence comes from a more detailed analysis of the zonal faunas.

TABLE 1

DISTRIBUTION OF SUBGENERA OF SCAPTIA

Subgenera	Total No. of Species	Numbers of Species in:						
		N. Qld.	S. Qld.	N.S.W.	Vic.	Tas.	S.A.	W.A.
Scaptia	28	8	15	21	7	3	1	5
Pseudoscione	25	3	6	14	7	1	1	7
Myioscaptia	7	3	2	5	—	—	—	1
Plinthina	7	1	1	3	—	—	1	5
Palimmecomyia	2	—	1	1	—	—	1	?1
Totals:	69	15	25	44	14	4	4	19

Northern Queensland.—The 24°S. line, rather than the Tropic, was chosen as the boundary between northern and southern Queensland in this study, because it marks the clearest division between the two faunas. Nevertheless, of the 14 northern species, only 1 *Scaptia*, 3 *Pseudoscione* (all belonging to the *concolor* subgroup), and 1 *Myioscaptia* are endemic, the remaining 9 extending into New South Wales.

Southern Queensland.—All 23 species occur also in New South Wales. Some of them are limited to its northern part, but 7 extend into Victoria.

New South Wales.—This State has the greatest number of species, 40, of which 9 (mostly rarities) appear to be endemic, 17 extend to the north, 7 to the south, and 7 both to the north and south. The most widely ranging species in Australia is *S. auriflua*, which extends from the Mackay district in north Queensland to Tasmania and South Australia.

Victoria.—The Victorian fauna is clearly an extension from New South Wales, all the 14 species being known also from that State. *Pseudoscione* is better represented than *Scaptia*, both in proportion of species and in numbers of specimens, while *Myioscaptia* has not been found, its southern known limit being on the coast at *c*. 35°S.

Tasmania.—With one exception, the fauna is merely a weak extension from the mainland. Of the four known species, *S. auriflua* and *S. patula* differ little from their mainland relatives, while *S. jacksonii* is so close to *S. alpina* of the southern highlands in New South Wales and Victoria that I thought at first to treat them as a pair of subspecies. The exception, *S. ianthina*, is still known only from the type.

South Australia.—Apart from an unconfirmed record of *S. singularis*, there are only *S. auriflua* from the east, and *S. guttipennis* from the west. Most of the present environment in South Australia seems to be unfavourable for groups of *Scaptia* that are not adapted to live in dry country.

Western Australia.—Twelve of the 13 recorded species are endemic, but they all have relatives in the east. In the subgenus *Scaptia*, *S. singularis* belongs to the *guttata* group, *S. minuscula* and *S. auranticula* are related to *S. subcana* and *S. berylensis*, while *S. tricolor* and *S. plana* are offshoots from *aurata–jacksonii* stock. In *Pseudoscione*, *S. gemina* pairs with *S. orientalis*, *S. calabyi* with *S. xanthopilis*, and all but one of the others either belong to, or are derived from, the *maculiventris* complex. Among these, *S. neotricolor* is distinctive, *S. guttipennis occidentalis* pairs with the typical subspecies in South Australia, and *S. georgii* and *S. bicolorata* are so like *S. auripleura* that I thought at first that they might not warrant specific separation. The remaining species, *S. regis-georgii*, is distinctive, and it is difficult to say whether its relationships lie with the *maculiventris* complex or the *calabyi–xanthopilis* pair. The only species of *Myioscaptia*, *S. gibbula*, is close to the eastern *S. calliphora*. No members of the *testacea* or *concolor* subgroups have been found in Western Australia. A striking feature of the western species, seen also in other families, is a tendency to unusual elongation of the proboscis and reduction of the labella, reminiscent of what is found in South America, and suggesting that flowers favoured in the west may have deeper calyces than those in the east.

Subgenera Plinthina *and* Palimmecomyia

Plinthina (Fig. 22, lower part of Table 1) differs from the subgenera already discussed in three, probably correlated, respects: it has its greatest development in Western Australia; its distribution in the east is mainly west of the Divide; and it seems to be better adapted to arid habitats than the others. The five species in Western Australia form a conspicuous element in the local fauna, with *S. binotata* extending eastward to Israelite Bay, and appearing again west of Spencer's Gulf and on Kangaroo I. in South Australia. Of the three eastern species, *S. clelandi* pairs with the western *S. subcinerea*, is itself known from two specimens from Western Australia, and is not uncommon west of the Divide in New South Wales, and at Eidsvold in Queensland where Eyrean and Bassian faunas mingle; *S. vertebrata* is certainly known only from coastal and high country north of the Tropic in Queensland, and from western New South Wales; and *S. nigerrima* is founded on a single specimen from coastal New South Wales.

The evidence of distribution would thus suggest that the subgenus probably evolved in Western Australia, and radiated to the east. However, there is no clear trend of morphological development to support this, and *S. vertebrata* may be nearer to its basic stock than any of the western species.

The distribution of *Palimmecomyia*, so far as it is known, agrees with that of *Plinthina*.

Relation to Altitude

A second characteristic of the "Antarctic" fauna is that it tends to predominate in the mountains of eastern Australia, with extensions to the coast, and sometimes also west of the Divide (Mackerras 1925; Mackerras and Fuller 1942). Analysis of local distribution in New South Wales (Table 2) and of Figure 22 shows that this is not true of the subgenera of *Scaptia*. It is, I believe, significant that only four of the southern montane species have been collected above 5000 ft, namely, *patula*, *alpina alpina*, *maculiventris*, and *anomala*. In Tasmania, where latitude is also important, *patula* is replaced by the *auriflua–patula* complex, and *alpina* by *jacksonii*.

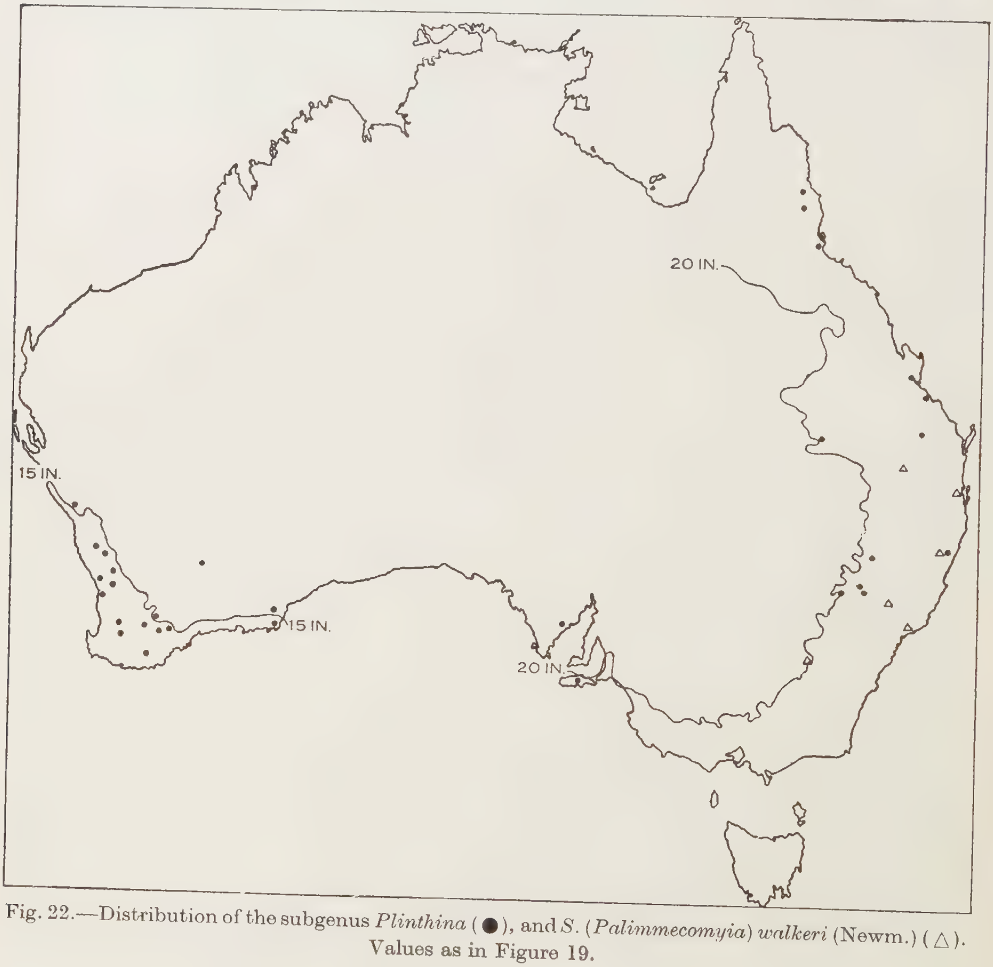


Fig. 22.—Distribution of the subgenus *Plinthina* (●), and *S.* (*Palimmecomyia*) *walkeri* (Newm.) (△). Values as in Figure 19.

Although the number of species in high country is comparatively small, individuals are abundant, or, at least, easy to find, and the same is true in Tasmania. Evidently, adaptation to life in a cool climate is efficient, when it does occur. There is, however, one reservation, in that the records are based almost entirely on adults, which are on the wing only during the summer months in the mountains, and which show a distinct tendency to drift up to the higher parts of an area. Larvae have not been found so far above about 4000 ft, and it would be desirable to search for them at greater altitudes, before attempting to define the limits of continuous occupation more precisely.

TABLE 2

LOCAL DISTRIBUTION OF THREE SUBGENERA OF SCAPTIA IN NEW SOUTH WALES

Subgenera	Numbers of Species			
	Predominantly Coastal	Predominantly Montane	Coastal and Montane	Totals
Scaptia	8	6	7	21
Pseudoscione	5	5	4	14
Myioscaptia	3	—	2	5
Totals:	16	11	13	40

Relation to Environment

Rainfall.—The limitations imposed by rainfall can be inferred from the maps. In Figures 19–21, the 25-in. isohyet encloses almost all the records of the subgenera *Scaptia*, *Pseudoscione*, and *Myioscaptia*, and most of the species would be bounded by the 30-in. line. Two species of *Scaptia* extend beyond the 25-in. line in Figure 19, *S. auriflua*, already noted as the most widely distributed of the eastern species, and *S. tricolor* in Western Australia. In *Pseudoscione* (Fig. 20), *S. testaceomaculata* is the only eastern species to reach the line, but the related *S. guttipennis guttipennis* extends well beyond it in South Australia, and so do *S. gemina*, *S. regis-georgii*, *S. neotricolor*, and *S. guttipennis occidentalis* in Western Australia.

The 15-in. isohyet in the west and the 20-in. isohyet in the east (Fig. 22) mark the limits of *Plinthina*, the only significant exception being a record of *S. cinerea* on the 10-in. line in Western Australia. *Palimmecomyia* is not known appreciably beyond the 20-in. line.

The evidence from distribution is supported by the scarcity of specimens after a drought in the higher rainfall areas, but it does not indicate whether the effect is directly on the insects, or indirectly through some other components of the environment. Sufficient moisture in the soil may be important for survival of the early stages, or emergence of the adults, although larvae do seem able to withstand considerable periods of desiccation. Soil moisture would also affect production of flowers and nectar by the plants on which many of the adults feed, but we do not know whether this would influence their fertility, as was found by Webber (1958) for *Lucilia*, nor do we know to what extent the adults themselves may tolerate desiccation.

Temperature.—It is evident from the maps that mild temperate to subtropical conditions are the most favourable; but more than a fifth of the species are adapted to survive in the tropics (Table 1), and five are known only from the tropics. Moisture requirements seem to become more stringent as the climate becomes hotter, as all specimens, even of *Plinthina*, from north of 24°S. are from places with substantially more than 30 in. of rain per annum. The lower limit is indicated more clearly, because only five species intrude appreciably into the subalpine zone, which Costin (1957*a*) has defined as having the ground covered with snow for one to four months in the year, mean monthly maximum temperatures of 60–75°F in midsummer, and mean monthly minima below freezing for about six months in the year and in the range 25–30°F in midwinter.

Biological Components.—These are more difficult to define, and the records are much less precise. Moreover, we do not know enough about host preferences to relate the distribution of the flies to the occurrence of animals on which they feed. It can only be said that species of the genus are found in sclerophyll *Eucalyptus* forest, both wet and dry, in open *Eucalyptus* parkland, in low bush and sandy heath country, and in swampy areas, especially in association with *Leptospermum*. They have not been found in rain-forest (except on the edges), nor in wide expanses of open grassland.

Seasonal Distribution

An additional characteristic of the "Antarctic" element in the Diptera is that adults generally emerge in spring on the coast and in summer on the mountains (Mackerras 1950). *Scaptia* (Fig. 23) does not show this typical picture at all clearly. The two major subgenera in eastern Australia predominate in the summer on the coast as well as the mountains, although a few species (*jacksoniensis*, *orientalis*, *auripleura*) are restricted to the spring. There is a tendency for a gradual displacement from later towards early summer from south to north, and for the species in Western Australia to appear earlier than those in the east. Three of the western species (*tricolor*, *gemina*, *neotricolor*) have only been taken in the spring, but the others tend to have a longer season. The three more specialized subgenera are also on the wing earlier than the others, particularly *Plinthina*, of which no specimens have been taken later than December.

Thus, the seasonal characteristics of the "Antarctic" element do appear in *Scaptia*, but they are obscured by the relatively wide adaptability of the genus.

Conclusion

The genus *Scaptia* is a good example of an important, but sometimes forgotten, component in the "Antarctic" fauna of the country. Much has been written about groups that are adapted to a cold temperate or alpine environment, but little about those that are adapted to mild temperate conditions. These have their principal development in the thirties of south latitude in South America and Australia, and are absent, or occur as renascent relics, in New Zealand. It is necessary to take them, as well as the cold-adapted groups, into account in any explanation of the faunal relationships and differences between the three countries.

The climatic limitations of the genus have probably been important factors in its local evolution, which is considered in the next section.

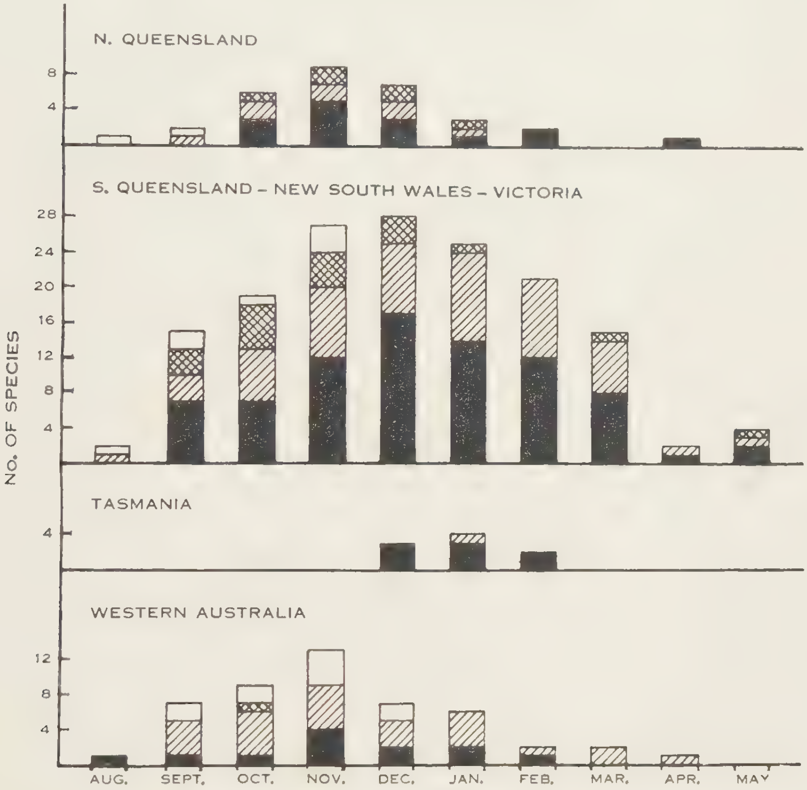


Fig. 23.—Seasonal occurrence of the subgenera of *Scaptia* in the principal divisions of Australia.

The Problem of Speciation

One cannot observe a substantial group of animals without wondering what isolating factors operated in the past to produce the multiplicity of species that we see today. The problem is sufficiently difficult at the specific level; but what are now the supraspecific divisions must also have had their origin in the splitting and isolating of previously continuous populations, so that it is necessary to carry the analysis back through the whole history of the group in the region. The task is to correlate inferences from three separate sets of facts against a background of present-day distribution. The facts are:

Morphological differentiation within the group.
Its environmental limitations.
The geological history of the country.

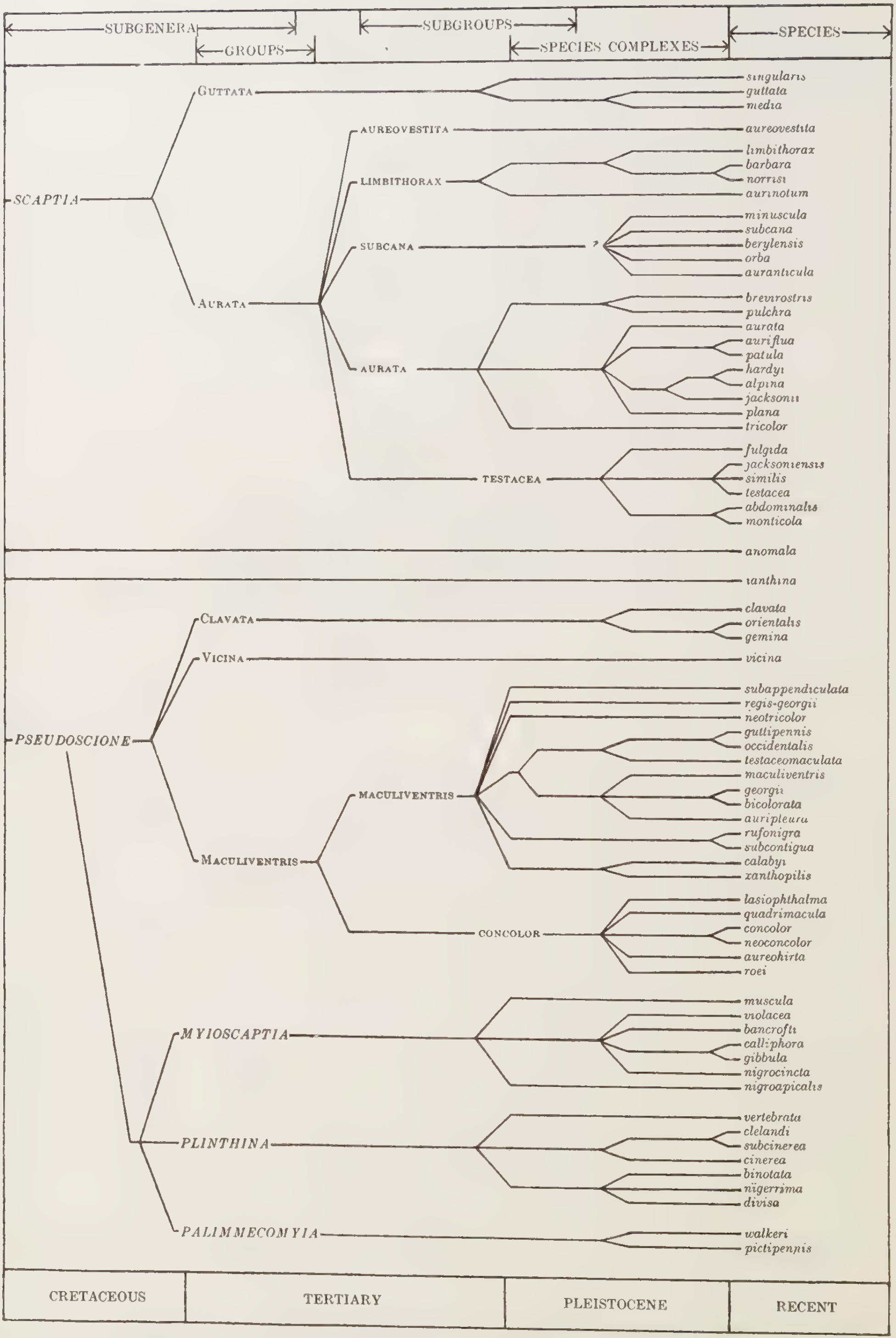


Fig. 24.—Diagram showing mutual relationships of Australian species of *Scaptia* (subspecies treated as species), with suggested time scale of their evolution.

Morphological Differentiation

When the Australian scionine fauna became separated from the rest of the world, it included at least three or four separate elements, representing the subgenera *Scaptia* and *Pseudoscione*, *S. anomala*, and possibly *S. ianthina* (Fig. 6). The general distinctiveness of the present fauna, and the absence of any groups in other regions (except possibly the *lata* group of *Scaptia* in South America) which would pair with groups in Australia, would suggest that they had not differentiated further. I have therefore treated them, for the purpose of the discussion, as if their subsequent evolution were entirely local, and began with a single species of each subgenus, ignoring collateral lines that may have been present.

The Australian taxonomy of the genus is discussed in the remaining sections of this paper. It is not unduly complicated, so it has been possible to summarize it in Figure 24. A diagram of this kind is a convenient way to see a group as a whole, but it inevitably involves over-simplification. At one end of the scale, the groups of *Pseudoscione* may not be as old as the groups of *Scaptia* and the locally developed subgenera; while, at the other end, some of the terminal bifurcations probably do not represent precisely how the species originated. Nevertheless, I believe that the diagram does give a fair representation of the interrelations and degrees of difference between the various categories.

The rates at which species change depend on their rate of mutation and the pressure of natural selection. We cannot measure mutation rates in *Scaptia*; but selection pressure depends on the environment, and I know of no major environmental changes that may have affected different sections of the genus differentially in a way that cannot be recognized and taken into account. It seems reasonable, therefore, in the absence of evidence to the contrary, to assume that most of the events shown at the same level in the diagram probably occurred within a relatively short period of geological time.

This leads to a striking feature of the analysis, which is that differences of the same order of magnitude have appeared repeatedly in different sections of the genus. They were not brought to the same levels in the diagram simply for neatness; those were fair approximations to where they fitted. This suggests that speciation has, in general, occurred in a series of five principal bursts or waves. Consequently, it may be possible to associate the major events in the evolution of the genus with recognizable geological events.

Environmental Limitations

As indicated earlier, species of *Scaptia* will not survive in very dry or very cold conditions. Moist heat is likely to be less of an impediment to dispersal and colonization than cold or drought, although extensive areas of rain-forest may present a significant barrier. Main, Lee, and Littlejohn (1958) distinguish Bassian from Eyrean frogs by their inability to survive in places with strongly seasonal rainfall, and most species of *Scaptia* remain Bassian by this criterion. It does not seem to matter whether the rain falls predominantly in summer or winter, but whether there is enough of it in most months of the year.

Marginal species (such as *S. testaceomaculata* and its allies) and the subgenus *Plinthina* differ from the rest of the genus in moisture requirements (they are Eyrean, in the sense of Main *et al.*), but their temperature limitations appear to be essentially the same.

Most of the species are active, strongly flying, robust insects, which would probably survive long enough to travel considerable distances. Barriers to their dispersal would therefore need to be substantial. So far as distance alone is concerned, the present width of Bass Strait is sufficient to prevent appreciable exchange of genes between the populations on either side of it. There may possibly be some infiltration from south to north, but there is clearly none from north to south. On the mainland, the division between east and west has both width and an unfavourable environment. Rainfall would have to be trebled for the south coast to become a corridor for Bassian species, and perhaps doubled for Eyrean species. On the other hand, the glacial barriers postulated during the Pleistocene would have depended, not on their height or width, but on the severity of the stress they would have imposed on the insects.

Using information of this kind in evolutionary reasoning involves the assumption that the limitations of the group have not changed significantly throughout its history. This assumption is commonly made by zoogeographers, and it is supported in *Scaptia* by the fact that the climatic limitations of South American species are similar to those of Australian species, while the New Zealand species differ only in being rather better adapted to cold.

Geological History—Mesozoic and Tertiary

The search for geological changes that may be significant in evolution can be simplified, if we accept two basic propositions. The first is that speciation depends on splitting populations, so that their parts are prevented from interbreeding for long enough to become genetically isolated. Relative isolation at the ends of a continuous distribution may have contributed, but the most clearly effective method of separation has been by physical barriers. The second proposition is that the steeper the environmental gradient in time or space, within limits of survival of the animals, the more intense will be the selection pressure, and consequently the more rapid will be the process of speciation. Both ideas have been implicit in a great deal of recent work.

The search for barriers and environmental gradients may begin in the latter part of the Mesozoic, for the consensus of opinion is that Australia became isolated then, and the vivid writing of David (1932), modified by more recent work, provides the kind of summary that can be used.

In the Cretaceous, Australia was divided more or less completely into two or three large islands by a wide shallow sea, which extended from the Gulf of Carpentaria, and perhaps Maryborough, across the continent to the Great Australian Bight. The climate was warm, and dicotyledonous plants appeared for the first time. Later the sea disappeared and lakes returned, the greatest being the Winton Lake, which stretched from Hughendon to beyond Lake Eyre. Swampy and lacustrine vegetation was abundant.

During the Tertiary, until the Pliocene, most of the continent was reduced to an enormous peneplain. Lateritization was widespread, forming a thick soil with the associated duricrust covering the underlying rock. Rain-forest vegetation extended into the interior, the sea intruded deeply on the south coast, and reef-forming corals occurred in Tasmania. Extensive series of basaltic lava flows covered, at one time or another, parts of Tasmania and areas aggregating more than 50,000 sq. miles in a belt 200 miles wide from Victoria into eastern Queensland (Browne 1958). In late Pliocene a great compensating uplift raised the old peneplain of eastern Australia and Tasmania many thousands of feet. The Flinders Range in South Australia continued to rise; elevation progressed all along the Great Australian Bight, and, aided by subsidence in the Lake Eyre region, established the modern region of internal drainage; and the Darling peneplain in Western Australia was raised about 1000 ft. This was the Kosciusko epoch, which ushered in the modern cycle of erosion, now largely in the canyon-cutting stage.

The climate was warm in early and middle Tertiary, with a brief period of tropical to subtropical conditions in southern Australia during the Miocene (Hill, personal communication). Geographical and seasonal zoning was diffuse at first, but later became better defined (Barghoorn 1953). Whitehouse (1940) has deduced the later Tertiary climates of Queensland from the occurrence of laterites and limestones, and his findings are in general accord with Axelrod's (1948) conclusions from the palaeobotany of California. There was a semi-arid phase at the end of the Miocene; a pluvial phase with earlier uniform, later seasonal, summer rain in early Pliocene; a second semi-arid phase in mid-Pliocene; another pluvial; and a third semi-arid (not referred to by Axelrod) leading into the Pleistocene. The climate was warm throughout, more uniform in the pluvials than in the dry periods, and the mid-Pliocene dry phase was the hottest and driest of all (Axelrod 1948). Recent work has suggested that Whitehouse's third cycle may belong to the Pleistocene, rather than the Pliocene (Hill, personal communication).

From the point of view of evolution, the first striking event in this history was the development of the Cretaceous sea, which would unequivocally split the ancestral populations of *Scaptia* into two, possibly three, isolated parts. This barrier, aided perhaps by a later division provided by the Winton Lake, would be sufficient to account for the origin of the local subgenera and species groups. The groups would have required little more at that stage than establishment of reproductively isolated populations with a capacity to survive until the present day. The subgenera would have needed more steps: first, segregation of a common ancestral species; then, sufficient time for the rudiments of the characteristic genitalic modifications to become established in both sexes; and finally, one or two steps in speciation to separate the ancestors of the three subgenera that exist today. I would suspect that there was time and change enough in the Cretaceous for all these things to have been accomplished.

Most of the Tertiary was a period of relatively uniform environment, and presumably, therefore, of evolutionary quiet. Competition and natural selection would certainly continue, leading to further differentiation of established species, and there was time, too, for some speciation by distance.

Only two kinds of more definitely isolating factors may have operated. One was the series of lava flows, some of which were probably extensive enough to break up populations. I have not been able to find out whether they would have left the areas they covered continuously barren for sufficiently long periods to induce speciation; but I suspect that the Oligocene flows may have played a part in splitting up the *aurata* group.

The other factors were the phases of relative aridity defined by Whitehouse (1940). All may have had an effect, in conjunction with temperature, by tending to limit populations of *Scaptia* to eastern, southern, and south-western coastal areas, but only the middle one, aided by the southern intrusion of the sea, was probably intense enough completely to isolate eastern from western populations. I suspect that it may have divided *Plinthina* into its two principal sections, segregated the ancestors of *tricolor*, *regis-georgii*, and *neotricolor* (and possibly of *singularis* and *minuscula*) in the west, and contributed to the evolution of the *maculiventris* complex.

S. xanthopilis represents rather old generalized stock, and the sequence *xanthopilis* (eastern) → *calabyi* (western) → *maculiventris* (eastern) is strongly suggested on morphological grounds. Ancestral *xanthopilis* was, no doubt, widely distributed in southern Australia during the first Pliocene pluvial. Continuity would have been broken during the following aridity, and the eastern population could have continued to evolve towards *xanthopilis*, while the western one developed towards *calabyi*. Ancestral *calabyi* could have diffused eastward during the second pluvial, and continuity would have been broken again, more or less completely, by the third semi-arid phase, leaving *calabyi* stock in the west and *maculiventris* stock in the east at the beginning of the Pleistocene. This sequence would make *calabyi* older than its morphological status in Figure 24, but I think that it more probably expresses the course of events.

There is another reason for postulating a dry period immediately preceding the first Pleistocene glaciation. The morphological sequences in Figure 24 suggest that the ancestors of the *limbithorax*, *testacea*, and *concolor* subgroups were already differentiated by the beginning of the Pleistocene. These subgroups are limited to relatively high-rainfall country in eastern Australia, but it is difficult to imagine that some representatives would not have survived, if they had ever reached the west. A pre-Pleistocene semi-arid phase (perhaps with a climate not unlike the present) would, however, have been a sufficient bar, and they would have been shut off from the west subsequently by an alternating succession of glacial barriers and deserts.

The Kosciusko uplift would have had no effect in itself (other than a mildly stimulating one) at this time, but it provided an important axis for the later Pleistocene glaciations.

In summary, I would visualize that the local subgenera and groups had probably become separate entities by the end of the Cretaceous; that the subgroups, most of the species complexes, and direct ancestors of some species developed in the Tertiary; and that the remaining evolution of the species and subspecies that we know today belongs to the Pleistocene and Recent. The suggested time scale is shown at the bottom of Figure 24.

Evolution in the Pleistocene

Changes in the Pleistocene were dramatic, and their effects on distribution and speciation of animals in Australia have received increasing attention in recent years (e.g. Serventy 1953; Endean 1957; Main, Lee, and Littlejohn 1958). My own interest was stimulated, partly by a study of the New Zealand Tabanidae (Mackerras 1957), and partly by finding the same difficulty as Main and his colleagues in accounting for the local evolution of closely related species in Western Australia.

Four glaciations, separated by three interglacials, of which the second was the longest (Fig. 25) have been recognized in the Northern Hemisphere (Daly 1934; Zeuner 1950). The climate during glaciations was strongly zoned, middle latitudes were pluvial, the arid and tropical belts were contracted towards the equator, and the cycle of evaporation and precipitation was accelerated; whereas in the interglacials the zones were diffuse, the arid belt was wide, and the condensation cycle was slowed (Willett 1953). Middle latitude temperatures of all the interglacials were about the same, and present-day temperatures are close to the highs of the past (Flint 1957). The last glaciation was followed by a warmer, drier period, the "thermal maximum", and it in turn by a "minor pluvial", from which we are now emerging.

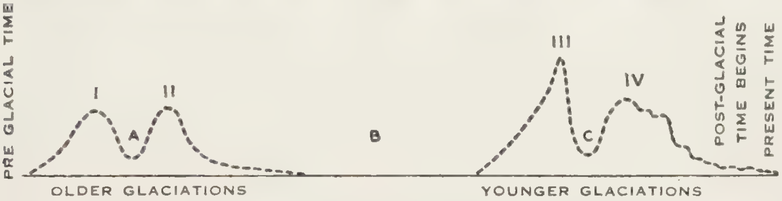


Fig. 25.—Diagram showing the sequence of the Pleistocene glaciations in the Northern Hemisphere. From Daly (1934), by permission of the publishers.

Australia is further from the pole, lacks really high mountains, and the evidence is less clear. Only three glaciations have been recognized, corresponding, it is thought, to the Mindel, Riss, and Würm of Europe (Fig. 25, II–IV). The first was the most intense, ice extending down to sea level in western Tasmania and to 4800 ft on Kosciusko (Browne 1957), and the following interglacial was the longer of the two (Lewis 1945). There is evidence for a post-glacial "great arid" (corresponding to the thermal maximum) and a minor pluvial (Browne 1945), but opinion is divided on the significance of these phenomena (e.g. Crocker and Wood 1947; Tindale 1949).

Glaciers covered about two-thirds of Tasmania and more than 150 sq. miles at Kosciusko (Browne 1957); they occurred in Victoria (Carr and Costin 1956; Costin 1957*b*) and possibly also in the mountains behind Canberra (Browne 1957; Costin, personal communication). No one has estimated the extent of the periglacial zone, which would be as inhospitable to *Scaptia* as the ice itself. To judge from analogy with Europe, it probably covered most of Tasmania and extended in a wedge from Victoria deeply into New South Wales, while alpine (also inhospitable) conditions occurred at Barrington Tops (Costin 1957*a*).

Each phase of a glacial cycle would have had two contrasting effects on a group with the climatic limitations of *Scaptia*. The glacial phase would, on the one hand, split south-eastern populations by a barrier of frost; while, in its pluvial aspect outside the glaciated area, it would provide a broad corridor joining eastern and western Australia. Conversely, the interglacial would convert the mountains, with their greatest claim on available rain, into the most favourable areas, but divide east from west by a desert. Glacial phases would also promote a northward drift of populations, which would not necessarily be fully compensated on the eastern side by retraction during interglacials. Finally, New Guinea and Tasmania were joined to Australia during glacial phases, and severed in the interglacials, although the southern corridor was probably available to groups like *Scaptia* for a short period only during the retreat of the glaciers.

The glaciations in Australia were not equally intense, so it cannot be assumed that they had equal effects. Nevertheless, the biological evidence seems to demand that all three provided effective isolating mechanisms. It can be presented best by analysing the different sections of the population separately, beginning with the simplest.

Tasmania.—The island would have been almost completely inhospitable to Tabanidae during the Malannan (presumed Mindel) glaciation. *S. ianthina* may have been a native, which survived in isolated sheltered pockets, as did its possible relatives in New Zealand, but the other three species are obviously derived from the mainland. The distribution of the *jacksonii* complex is shown in Figure 26. These three forms are very alike in external characters, but the genitalic differentiation of *jacksonii* suggests that the population from which it developed was isolated longer than the other two. It may, perhaps, have entered Tasmania at the end of the second glaciation, and, coming from relatively cold-adapted stock, survived the weaker third. On the other hand, the Tasmanian and southern mainland populations of *S. auriflua* and *S. patula* (Fig. 27) are similar, and it seems likely that these species did not reach Tasmania until the end of the last glaciation.

Western Australia.—Main, Lee, and Littlejohn (1958) postulated that the frogs they studied had been divided into Bassian and Eyrean elements in late Tertiary; that there were three Pleistocene migrations of both elements to Western Australia, of which descendants of all the Eyrean migrations survived, but only those of the later Bassian; and that environmental factors prevented return migrations from the west. The genus *Scaptia*, with a wider range of adaptation to climate, resembles the frogs in some ways, but differs in others.

Morphological grading indicates that there are four elements in the *Scaptia* fauna of Western Australia. These are, in descending order of differentiation from their eastern relatives:

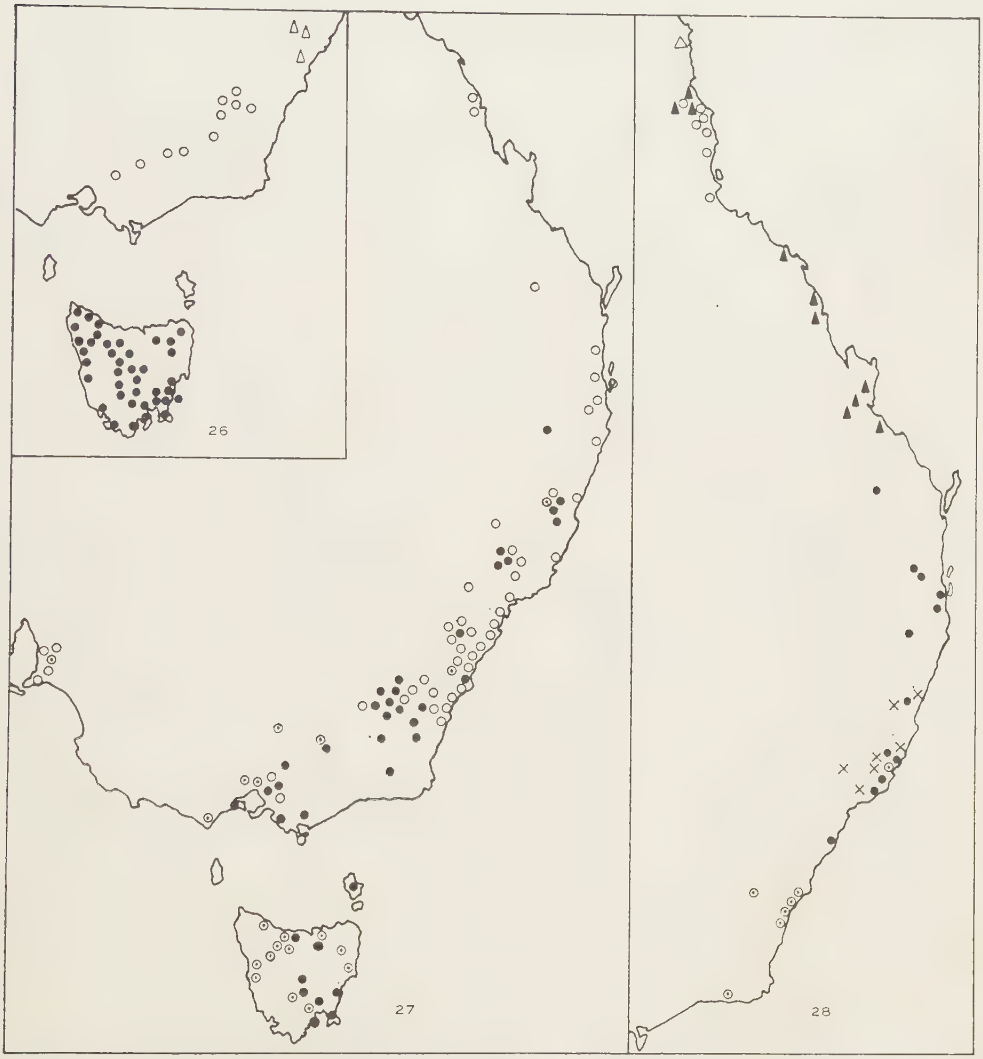
(I) (oldest): *singularis*, ?*minuscula*, *tricolor*; *regis-georgii*, *neotricolor*; *binotata*, *cinerea*.

(II) ?*auranticula*, *plana*; *guttipennis occidentalis*, *georgii*, *calabyi*; *divisa*.

(III) *gemina*, *bicolorata*; *gibbula*; *subcinerea*.

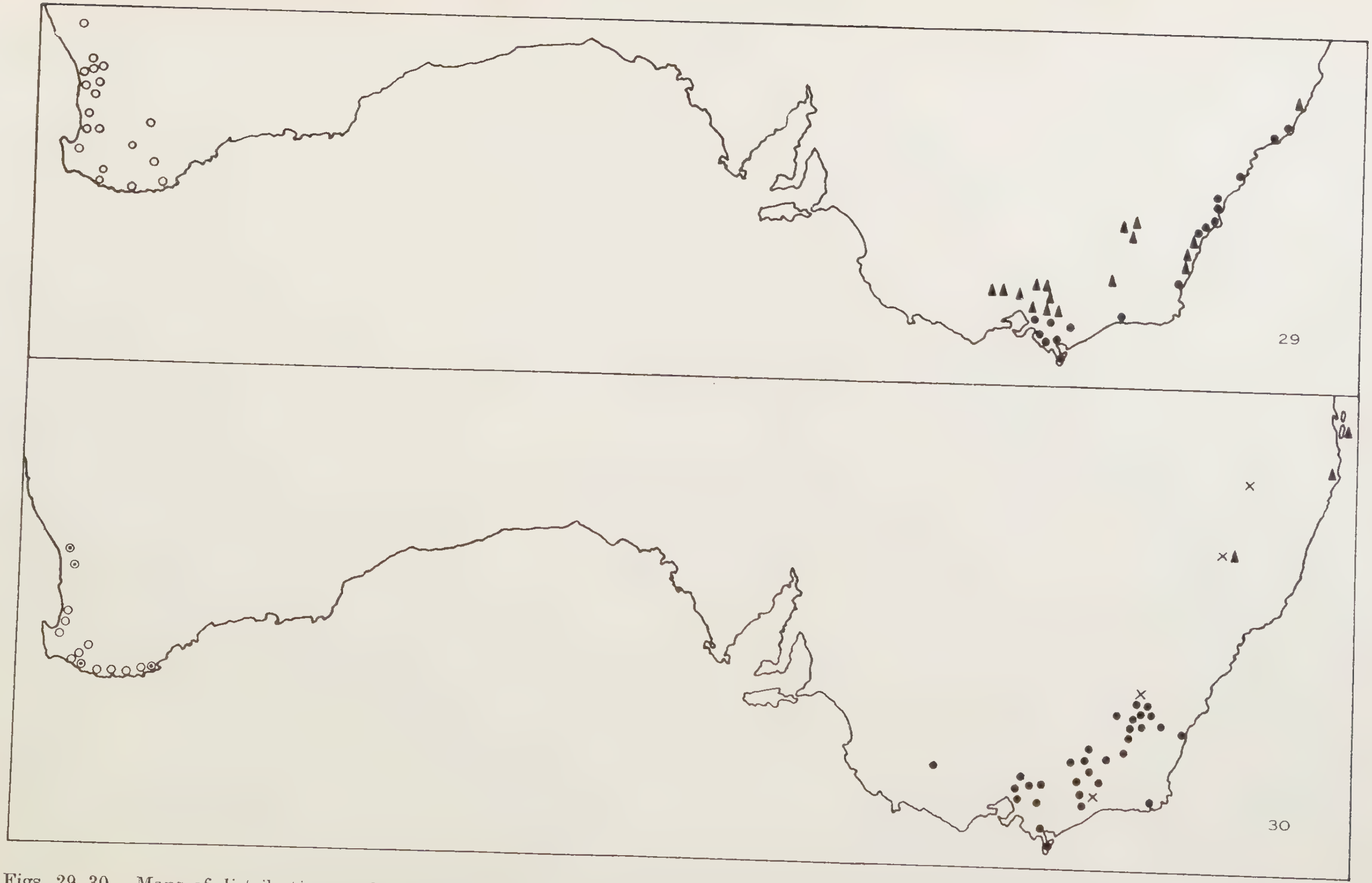
(IV) (recent): *guttipennis guttipennis*; *clelandi*.

As indicated earlier, the first category was probably established in the Pliocene. The second and third are thought to have been Pleistocene colonists, with traffic both ways; while the infiltration of Eyrean *guttipennis guttipennis* and *clelandi* in the west and of *binotata* in South Australia may have occurred in the "minor pluvial" within the last 3000 years.



Figs. 26–28.—Maps of distribution, each spot representing a locality record. 26, the *jacksonii* complex, subgenus *Scaptia*: △, *alpina hardyi*, subsp. nov.; ○ *alpina alpina*, sp. nov.; ● *jacksonii* (Macq.). 27, the *auriflua-patula* complex, subgenus *Scaptia*: ○ *auriflua* (Don.), typical; ⊙ *auriflua*, other races; ● *patula* (Walk.), all races. 28, the *concolor* subgroup, subgenus *Pseudoscione*: △ *roei* (Macl.); ▲ *aureohirta* (Ric.); ○ *neoconcolor*, sp. nov.; ● *concolor* (Walk.); × *quadrimacula* (Walk.); ⊙ *lasiophthalma* (Macq.).

The usual course of events appears to have been similar to that postulated for the *maculiventris* complex in the Pliocene, the simplest example, and the one most difficult to explain in other ways, being provided by the *clavata* group (Fig. 29). The



Figs. 29, 30.—Maps of distribution, each spot representing a locality record. 29, the *clavata* group, subgenus *Pseudoscione*: ▲ *clavata* (Macq.); ● *orientalis*, sp. nov.; ○ *gemina* (Walk.). 30, the *maculiventris* complex, subgenus *Pseudoscione*: ▲ *auripleura* (Tayl.); ● *maculiventris* (Westw.); × *testaceomaculata* (Macq.); ○ *georgii* (Tayl.); ⊙ *bicolorata* (Tayl.).

sequence of evolution is *clavata* (E)* → *gemina* (W)* → *orientalis* (E), but the distribution from east to west is *orientalis*, *clavata*, *gemina*. The evolutionary sequences here and later refer, of course, to ancestral populations, and the suggestion here is that ancestral *clavata* diffused from east to west during one pluvial, speciation occurred during the following interglacial, the new *gemina* stock spread eastward in the next pluvial, and its eastern portion differentiated into *orientalis* subsequently. This suggestion is supported by the plausibility of a similar explanation for *testaceomaculata* (E) → *guttipennis occidentalis* (W) → *guttipennis guttipennis* (S), and *bancrofti* (E) → *gibbula* (W) → *calliphora* (E). Evolution of the *maculiventris complex* (Fig. 30) was slightly more complicated, there being two sequences, *maculiventris* (E) → *georgii* (W) → *auripleura* (E), and *maculiventris* (E) → *bicolorata* (W) probably contemporaneous with the *georgii* → *auripleura* migration.

Other migrations are not so clearly indicated in the major subgenera, but the sequence *orba* (E) → *auranticula* (W) might be plausible. *Plinthina*, however, fits into the picture very well, provided it is accepted as already divided into two sections. The sequences would then be *binotata* (W) → *nigerrima* (E) → *divisa* (W) and *cinerea* (W) → *clelandi* (E) → *subcinerea* (W), with *vertebrata* a separate eastern offshoot, possibly from earlier, undivided stock.

Thus, evolution of the *Scaptia* fauna of Western Australia would have required the same corridors and barriers as the frogs; but there was greater survival in western refugia during interglacials, and no impediment to eastward movement during pluvials. The evidence suggests that only two glaciations were involved in the evolution of the species in the second and third categories.

Eastern Australia.—Analysis of the eastern fauna is more difficult, because there are many more species to be accounted for, and because the climatic changes were more complex. Speciation could have occurred on either side of the Dividing Range during glaciations, and along the coast during interglacials. Also, if the preceding interpretation of the western fauna is correct, timing of events on the eastern side must have accorded with it.

The species and their ancestral stocks can be arranged in five categories, omitting those that have already been discussed:

(I) (oldest): *aureovestita*, *aurinotum*, *brevirostris–pulchra* stock; *vicina*, *subappendiculata*; *muscula*, *nigroapicalis*.

(II) *limbithorax*, ?*subcana*, ?*berylensis*, ?*orba*, *brevirostris*, *pulchra*, *aurata–auriflua* stock, *alpina–jacksonii* stock, *fulgida*; *testaceomaculata*, *maculiventris*, *lasiophthalma*, *concolor*, *aureohirta*; *violacea*, *bancrofti* complex.

(III) *guttata*, *media*, *barbara*, *aurata*, (*jacksonii*), *jacksoniensis–testacea* stock, *abdominalis–monticola* stock; *subcontigua*, *quadrimacula*, *roei*; *nigrocincta*.

(IV) *auriflua*, *patula*, *alpina*, *jacksoniensis*, *similis*, *testacea*, *abdominalis*, *monticola*; *rufonigra*, *neoconcolor*.

(V) (recent): ?*norrisi*, *alpina hardyi*.

Those in the first category were probably separate entities by the end of the Pliocene. It is convenient to begin the analysis of the remainder with the separation of *testaceomaculata* from *maculiventris*, because it provides the best key to the problem of timing, and it is also the only example (other than the much older subgenera *Plinthina* and *Palimmecomyia*) of a division of the genus into broadly Eyrean and Bassian elements.

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* E, eastern; W, western.

Main, Lee, and Littlejohn (1958) considered that the Kosciusko uplift provided the barrier which led to the development of Bassian and Eyrean species of frogs. Serventy (1953) separated the ancestors of paired Bassian and Eyrean species and subspecies of birds much later by a combination of barriers, which included the glaciated mountains, late lava flows, and Pleistocene lakes. Of these factors, only a glaciation would seem adequate to split the *maculiventris* population in a way that would have produced the result that was achieved. This suggestion would accord, both with the suggested evolution of *maculiventris* stock in the east at the end of the Pliocene, and with the present distribution of the two species (Fig. 30). It would follow, from their subsequent history already outlined, that the division occurred in the first glaciation, and that all three glacial cycles contributed to speciation. Categories II, III, and IV in the east would correspond, broadly, to the three cycles, but II and III in the west would belong mainly, if not entirely, to the second and third.

It is not possible to discuss all the species, but it seems that three different mechanisms of speciation may have operated:

(1) Some purely eastern species could have evolved into pairs through a western link, as already suggested, but the western representative failed to survive, as happened with the earlier Bassian waves of frogs. Such a sequence might, for example, have produced *brevirostris* (E) → ? (W) → *pulchra* (E), but there is no direct evidence to support it.

(2) The glacial wedges may have split other eastern populations besides *maculiventris* and *testaceomaculata*. Those on the western side would probably encounter something of a rain-shadow, even during a pluvial, and they would have to be sufficiently adapted to cold to retreat to the mountains during the waning of the glaciation. Pairs that might have separated in this way are *patula* and *auriflua*, *abdominalis* and *monticola*, *rufonigra* and *subcontigua*.

(3) A continuous coastal distribution could have been broken into segments. This was probably the most frequent method, so it may be examined in somewhat greater detail.

The simplest case is the *alpina–jacksonii* complex (Fig. 26), which has already been discussed. The principal factor here was probably restriction to a cool, moist environment, which seems to have provided a background for speciation in some more primitive Tabanoidea also.

The *concolor* subgroup (Fig. 28) is a good example of a much commoner kind of distribution. The species are limited to mild to warm climates with substantial rainfall, and there is a north to south sequence, with some overlapping, especially in the middle of the range. However, the two most closely related species, *concolor* and *neoconcolor*, are allopatric. Populations of this kind would have diffused up the coast during cooler phases of the glacial cycles. They would tend to retreat in the warmer phases; but it seems probable, from ordinary meteorological principles, that substantial patches of coast would still have had a considerable annual rainfall during the driest times, and these would be occupied by residual populations. At the same time, there was a waxing and waning of rain-forests (Baur 1957), and these may have divided populations on the coast, even during pluvials. These changes, occurring three times, plus some post-Pleistocene diffusion, seem to me to be sufficient to explain both the coastal species that we see today and their distribution. Indeed, they may account also for some of the speciation for which other mechanisms have been suggested.

New Guinea.—All the species were derived from Australian *Pseudoscione* stock, and there is evidence of three waves of invasion. The first includes only *S. novaguineensis* (Ric.), a distinctive species, which seems to be most nearly related to the older *vicina* or *subappendiculata* elements. The second contains five species of the *maculiventris* subgroup. They are well differentiated morphologically, and are now separated from their nearest relatives by more than 1200 miles. The third contains six species of the *concolor* subgroup. Some are well differentiated, but *S. taylori* Oldr. is scarcely more than a nascent species of the *concolor–neoconcolor* series, and separation from Australian members of the subgroup is less than 600 miles.

S. novaguineensis may possibly have been a Pliocene colonist, but it seems more likely that the three waves of invasion correspond to the three periods of northward movements and low sea-levels during the glaciations. There may have been overlapping, with some of the *concolor* subgroup contributing to the second wave, and the remainder constituting the third. It is evident that local speciation also occurred in New Guinea, but that problem need not be discussed here.

Conclusion

Enquiries of this kind are necessarily speculative, because there is usually no means to check their results from fossil evidence. Nevertheless, they serve a useful purpose by making us look at our species dynamically.

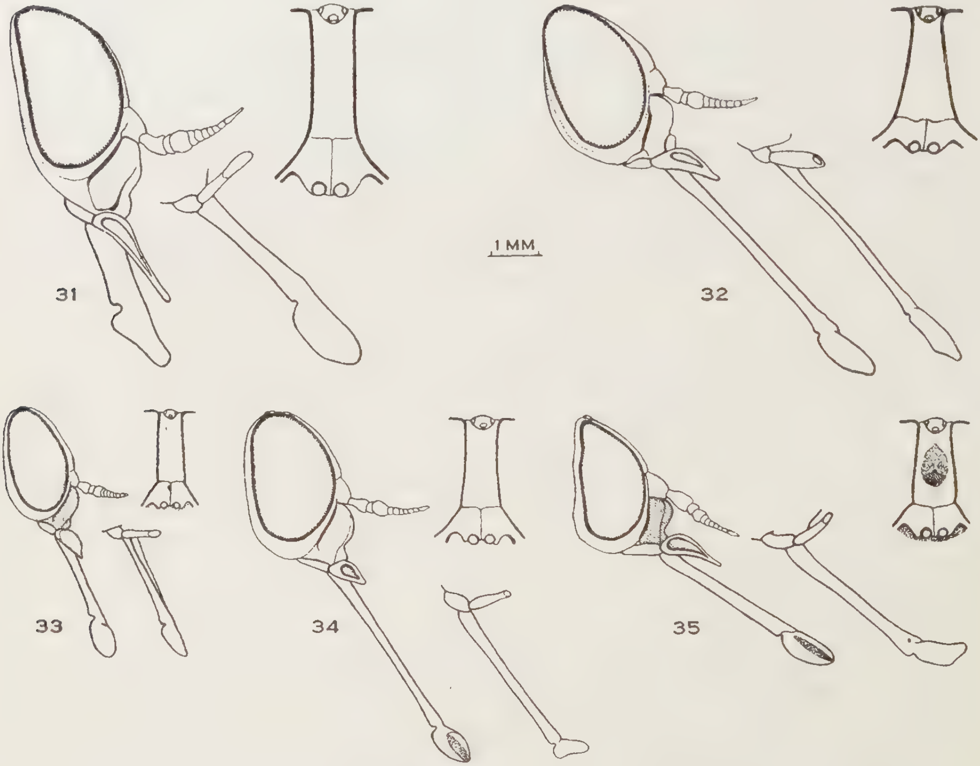
The general idea that evolution occurred in waves, with an outburst in the Cretaceous, followed by a long period of quiet, and then by an increasing tempo of speciation in response to increasing speed and amplitude of climatic change, culminating in the Pleistocene, fits the available facts, although details may be wrong. In particular, the distinction between Pliocene and Pleistocene evolution is somewhat arbitrary, and it may have been wrong to ignore the possible effects of interstadials.

It will be necessary to analyse other groups of animals, and to examine the factors that have governed speciation in northern Australia, before the general validity of the conclusions can be accepted. The difficulty will be to find groups which meet the essential prerequisite, that the relationships between the species can be assessed with the same confidence as in *Scaptia*. Complete concordance is not to be expected, even in southern groups, and the kinds of resemblances and differences that have been found between *Scaptia* and the frogs tend to strengthen rather than weaken confidence in the findings.

Classification

Subgenera

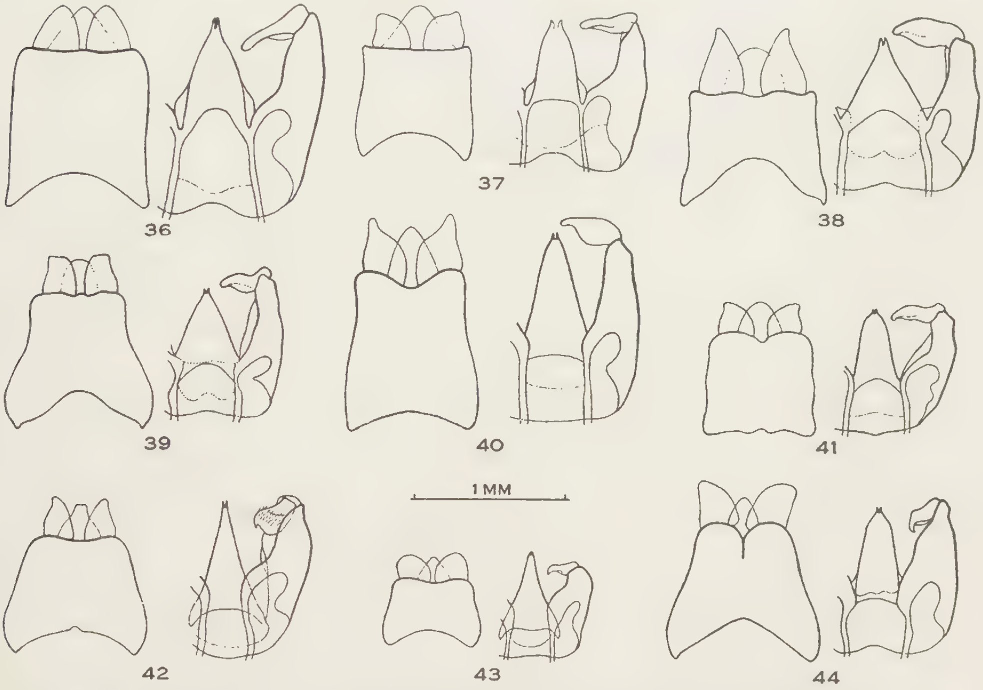
It is not difficult to define the subgenera in Australia. *Scaptia* and *Pseudoscione* can nearly always be separated readily on characters of the proboscis, palpi, and frons (Figs. 31, 32), so the absence of supporting differences in the genitalia is comparatively unimportant. On the other hand, *Myioscaptia*, *Plinthina*, and *Palimmecomyia*, which are less precisely differentiated on external features (Figs. 33–35), have genitalic characters in both sexes that can be used as final criteria of identification. The pointed styles of the males (Figs. 42–44) were described when the subgenera were defined, and it has since been found that the females have the lateral arms of the furca fused to the edges of the 9th tergite to form a complete chitinous ring, whereas furca and tergite are quite separate in all other Scionini examined.



Figs. 31–35.—Head and frons of ♀, palp and proboscis of ♂, of: 31, *S.* (*Scaptia*) *singularis* (Macq.); 32, *S.* (*Pseudoscione*) *maculiventris* (Westw.); 33, *S.* (*Myioscaptia*) *violacea* (Macq.); 34, *S.* (*Plinthina*) *clelandi* (Ferg.); 35, *S.* (*Palimmecomyia*) *walkeri* (Newm.).

The genitalic differences are included in the keys to subgenera as subsidiary characters of the females and for primary division of the males, which is a fair expression of their working utility in placing species correctly.

S. anomala is exceptional, in combining the short proboscis and long palpi of *Scaptia* with the diverging frons and general appearance of *Pseudoscione*. I have allotted it provisionally to *Pseudoscione* but included it in the keys to the species of both subgenera, so it should not escape recognition. Other more or less unusual species are noted under the subgenera but they cause more difficulty in framing succinct definitions than in practical identification.



Figs. 36–44.—Genitalia of ♂♂, illustrating range of variation in the subgenera. 36, *S.* (*Scaptia*) *singularis* (Macq.); 37, *S.* (*S.*) *patula* (Walk.); 38, *S.* (*S.*) *norrisi*, sp. nov.; 39, *S.* (*Pseudoscione*) *gemina* (Walk.); 40, *S.* (*Ps.*) *vicina* (Tayl.); 41, *S.* (*Ps.*) *maculiventris* (Westw.); 42, *S.* (*Plinthina*) *clelandi* (Ferg.); 43, *S.* (*Myioscaptia*) *violacea* (Macq.); 44, *S.* (*Palimmecomyia*) *walkeri* (Newm.).

The degrees of relationship that are expressed by a classification into genera and subgenera vary with the outlook of the worker, and a case could be made for establishing two more subgenera in *Scaptia*. One would be for *S. anomala*, and that may prove to be a proper course when more is known about it. The other would be for the *guttata* group, which is a clearly defined unit with a name already available. However, I can see no virtue in doing this, because the present subgenus *Scaptia* is not unwieldy and the *guttata* group is not out of place in it. I prefer the less formal concept of species groups, which do not burden the literature with names that may not ultimately be needed. It can be extended to include subgroups and species complexes, and one is then left with a series of convenient small packets of closely related species, linked together in a way that demonstrates their relationships clearly (Fig. 24). This seems to me to be a most desirable aim in any descriptive work.

Keys to Australian Subgenera of Scaptia

Females

1. Elongate, parallel-sided, rather wasp-like species, with waxy integument, projecting subcallus, shining face, and flavid, brown-tipped wings (Plate 3, Fig. 27; Plate 4, Fig. 39); proboscis and palpi as in *Pseudoscione*; arms of furca fused with lateral edges of 9th tergite .... *Palimmecomyia* Tayl.

   Not such species; furca fused with 9th tergite or free 2

2. Frons distinctly diverging; proboscis not shorter than one and a half times head height; palpi less than half length of shaft, usually pointed and with deep lateral concavity, occasionally truncate, sometimes slender (Figs. 99–119); furca free from 9th tergite .... *Pseudoscione* Lutz, Araujo, & Fonseca

   Frons parallel, slightly converging, or slightly diverging; proboscis not longer than one and a quarter times head height; palpi otherwise 3

3. Frons nearly always parallel or slightly converging; proboscis usually short, stout, with large labella; palpi usually longer than half the shaft, flattened, narrow or tapering, with lateral bare area (Figs. 45–74); atypical species are not metallic, nor with marbled wings, and have cell R_5 open; furca free from 9th tergite .... *Scaptia* Walk.

   Frons usually slightly diverging; proboscis more slender, up to one and a quarter times head height; palpi much shorter than half the shaft (Plate 3, Figs. 21–26); furca fused with 9th tergite 4

4. Small, rotund species, usually metallic or semimetallic, and usually without clearly defined scutal or abdominal pattern; palpi flattened, leaf-like (Figs. 152–158); wings clear; cell R_5 narrowed or closed .... *Myioscaptia* Mack.

   Normal species, with at least indications of scutal vittae, and abdomen usually dark red or black; palpi thicker, with large lateral concavity (Figs. 166–172); wings usually marbled (if clear, abdomen has well-defined pattern); cell R_5 closed, petiolate .... *Plinthina* Walk.

Males

1. Style of hypopygium rounded at tip, finger-like (Figs. 36–41) 2

   Style of hypopygium hooked and pointed (Figs. 42–44) 3

2. Palpi slender, with lateral bare area (Fig. 31); proboscis relatively short and thick .... *Scaptia* Walk.

   Palpi wider, nearly always with apical pit (Fig. 32); proboscis relatively long and slender .... *Pseudoscione* Lutz, Araujo, & Fonseca

3. Elongate, parallel-sided species, with waxy integument, and flavid, brown-tipped wings .... *Palimmecomyia* Tayl.

   Not such species 4

4. Small, rotund, usually metallic or semimetallic species, with clear wings; style of hypopygium not unusually wide, nor with band of strong setulae (Fig. 43) .... *Myioscaptia* Mack.

   Normal species, with wings usually marbled, and cell R_5 closed, petiolate; style of hypopygium very wide, and with band of strong setulae (Fig. 42) .... *Plinthina* Walk.

Species and Subspecies

In the previous section, we were concerned with evolution, and the recent forms discussed could be treated simply as separate populations. There remains the problem of their proper taxonomic status, an ever-present worry to workers on all sections of the Tabanidae. The essential difficulty is that no cytological studies have yet been made, breeding experiments are impracticable, and the available series of specimens are often too short for effective analysis. All one can do is to state clearly what has been done in this particular work.

Of the 71 separate entities described, 49 would be accepted as "good" species by any worker on the family, including five (*aurata*, *jacksonii*, *testaceomaculata*, *auripleura*, *neoconcolor*) in which relatively weak external characters are supported by distinctive female genitalia. The remaining 22 form 11 pairs, which are distinct from any of the preceding, so the number of good species is not less than 60. The 11 pairs have been disposed of in the following way:

> (1) *Sibling species.*—I have used this category rather broadly, to include closely similar sympatric forms, which are nevertheless always separable on the available material; and also similar allopatric forms which seem to me to differ too much to be treated as subspecies. There are three sympatric pairs (*jacksoniensis–similis*, *georgii–bicolorata*, *rufonigra–subcontigua*) and three allopatric pairs (*orientalis–gemina*, *calliphora–gibbula*, *clelandi–subcinerea*). I think that all are good species.
>
> (2) *Subspecies.*—This category has been used by many workers on the Tabanidae (Oldroyd is an exception) for many kinds of similar forms, simply because it is nomenclaturally valid. I have used it in the strict sense for two allopatric pairs, which I think might interbreed if they came together. They are *alpina–hardyi*, which probably are true subspecies, and *guttipennis occidentalis*, which are almost as likely to be allopatric sibling species.
>
> (3) *Variable species with overlapping phenotypes.*—Two pairs are included here: *auriflua–patula*, in which the males remain distinct throughout their common range, and the females are distinct in the north, but merge in the south; and *monticola-abdominalis*, which are usually distinct, but of which a few specimens are difficult to allot.
>
> (4) *Possible polymorphic species.*—In addition to a variable amount of continuous variation, there are possible indications of discontinuous polymorphism in shape of frons (Fig. 53), palpi (Fig. 153), female genitalia (Fig. 134), and colour of pleural hairs (*S. subcana*). I suspect also that *barbara* and *norrisi* may be no more than sharply distinguished forms of a single, polymorphic species, but the material is too scanty to justify any conclusion, so I have described them provisionally as separate species.

Notes on the Descriptions

Species of which the types have been examined personally (other than types designated in this paper) are indicated by asterisks (*) in the citations at the beginning of the descriptions.

Adequate descriptions occupy a great deal of space, but I have found no way to shorten them effectively. A few species are described by differences from their nearest relatives, and some characters, such as the basicosta, stigma, squames, and halteres are described only when they are distinctive.

Colours of the eyes in life are recorded, when known, but it is convenient to summarize the findings for females here:

Conspicuously banded or bicolored: *brevirostris*, *pulchra*, *aurata*, *auriflua*, *patula*.
Red, becoming green after death: *subcana*, *berylensis* (colours not recorded for other members of subgroup).
Concolorous green or brown, with variable brown or green reflections: All other species observed.

The male genitalia have given no assistance in discriminating between species, so I have simply included a representative series in Figures 36–44 and Figure 150 to show the range of variation in the genus. On the other hand, the terminal segments of the females, particularly the gonopophyses of the 8th sternite, have occasionally proved so useful, that I felt it might save future workers considerable labour to have illustrations of nearly all the species available to them. These are brought together in Figures 75–81, 82–90, 91–98, 124–131, 132–139, 140–147, 151, 159–165, 175–181, 182–183. It is a point of interest that degrees of difference in the genitalia bear little relation to degrees of difference in external characters.

IV. Subgenus SCAPTIA Walker

Scaptia Walker, 1850, p. 8; Ferguson 1924, p. 252, 1926*a*, p. 298; Mackerras 1955*a*, p. 490. Type species *Pangonia aurata* Macquart, 1838, Australia, by designation of Coquillett 1910, p. 603.

Apocampta Schiner, 1867, p. 310. Monotypic for *Apocampta nigra* Schiner, 1868 (= *Pangonia subcana* Walker, 1848), Australia. Synonymy by Ferguson 1926*a*, p. 300.

Triclista Enderlein, 1922, p. 339, 1925, p. 304. Monotypic for *Pangonia limbinevris* Enderlein, 1922, nec Macquart, 1855 (= *Pangonia singularis* Macquart, 1845), Australia. Synonymy by Ferguson 1926*a*, pp. 299, 304. Available, if the *guttata* group were raised to subgeneric rank.

Female

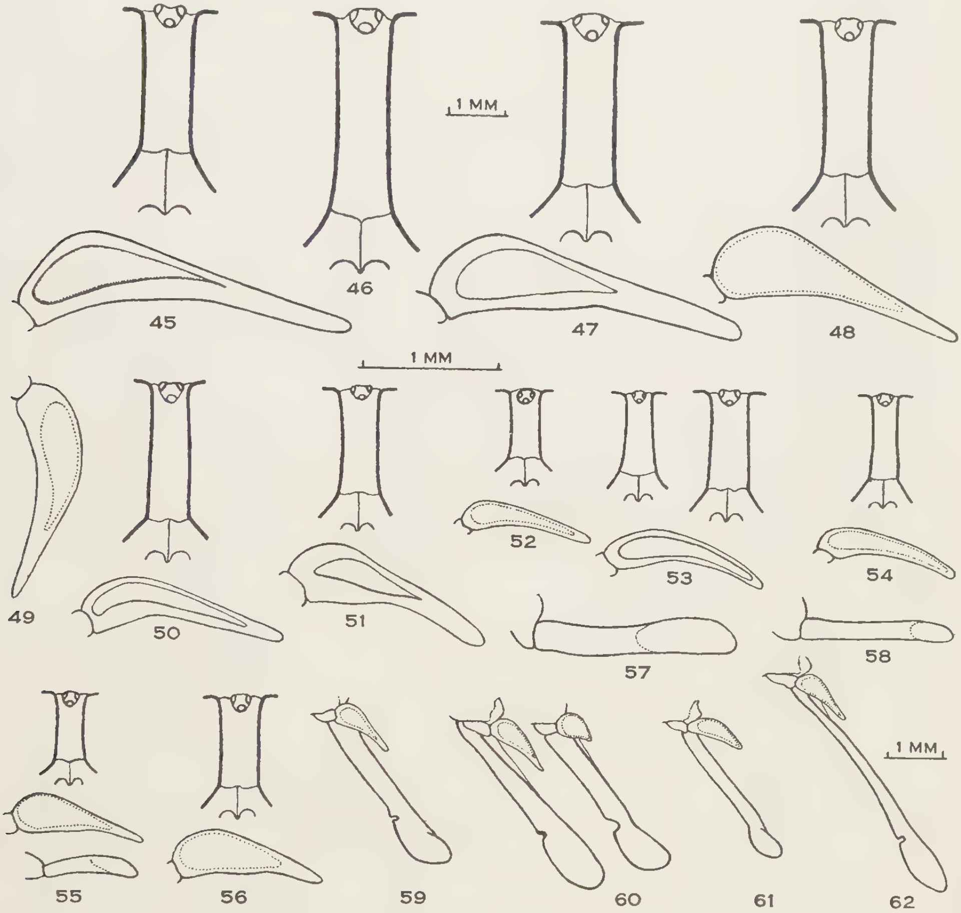
Mostly solidly built species, with rather shorter, stronger legs than in subgenus *Pseudoscione*. Frons normally parallel or slightly converging. Face truncate. Proboscis normally not longer than height of head, stout, with large, usually soft, labella. Palpi normally more than half the length of the shaft of the proboscis, often as long as shaft, usually laterally compressed, and with an extensive lateral bare area or shallow concavity. Cell R_5 usually open, sometimes narrowed, rarely closed except in *guttata* group. Eighth sternite with gonopophyses often rounded (Figs. 75–98); cerci often truncate apically; lateral arms of furca not fused with 9th tergite.

Male

Proboscis as in ♀, but usually more slender. Palpi short, slender, cylindrical, obliquely truncate at tip, and with a lateral bare area distally. Style of hypopygium finger-like, rounded at tip (Figs. 36–38).

There are some anomalous species, which do not conform completely to the definition. Many specimens of *subcana* have a somewhat diverging frons, but the proboscis is short and stout, and the palpi are long. Five species (*plana*, *tricolor*, most specimens of *jacksonii* and *alpina*, and a few of *pulchra*) have palpi which do not reach the middle of the proboscis, and in *jacksonii* the proboscis is often rather longer than the head height, whilst in *tricolor* the labella are quite small and firm (Figs. 59–62). They can all, however, be distinguished from Australian *Pseudoscione* by their parallel frons and the shape of their palpi, and from *Myioscaptia* and *Plinthina* by their palpi, colour pattern, and open cell R_5.

There are several groups of related species in the subgenus, but only two can be defined precisely. These are recognized here, leaving the bulk of the species in the *aurata* group, within which five subgroups may be distinguished:

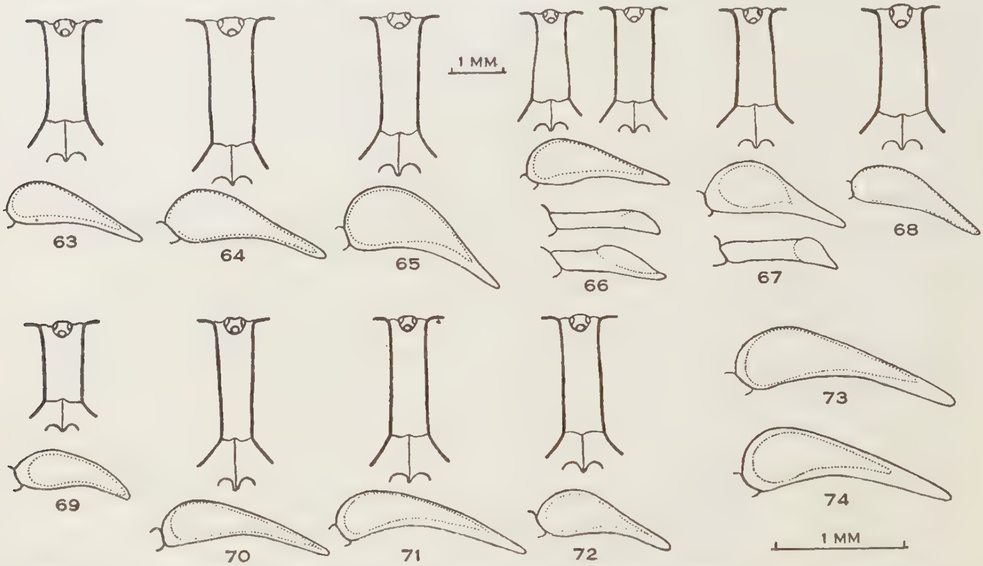


Figs. 45–62.—Subgenus *Scaptia*, mostly females. 45, *singularis* (Macq.); 46, *guttata* (Don.); 47, *media* (Walk.); 48, *aureovestita* (Ferg. & Henry); 49, *limbithorax* (Macq.); 50, *barbara*, sp. nov.; 51, *aurinotum*, sp. nov.; 52, *minuscula*, sp. nov.; 53, *subcana* (Walk.), showing variation in frons; 54, *berylensis* (Ric.); 55, *auranticula*, sp. nov., including palp of ♂; 56, *orba*, sp. nov.; 57, *singularis*, ♂; 58, *barbara*, ♂; 59, *alpina alpina*, sp. nov.; 60, *jacksonii* (Macq.), showing variation in palpi; 61, *tricolor* (Walk.); 62, *plana* (Walk.).

The guttata *Group.*—Very large (16–24 mm), dark species, with short, thick proboscis, long, rather sabre-like palpi (Figs. 31, 47), clouded wings, and white-flecked abdomen; cell R_5 closed; cell M_3 usually narrowed, closed in nearly all specimens of *singularis* and a few of *guttata*. Includes: *singularis*, *guttata*, *media*.

The aurata *Group*.—The typical members of the subgenus; variable in size (7–18 mm), pattern, and shape of palpi in ♀; but distinguished from the *guttata* group by having cell R_5 nearly always open, cell M_3 not narrowed, different wing pattern, different abdominal markings, and nearly always by much smaller size. *S. guttata* and its allies are giants, members of the *aurata* group are ordinary, and separation of the two groups is simpler in practice than it is on paper.

The aureovestita *Subgroup*.—A large (15 mm), concolorous yellow species; distinguished by the almost uniform covering of dense golden hairs on scutum and abdomen, slightly flavid wings, closed or narrowly open cell R_5, and relatively long palpi. The venation leads towards the *guttata* group, but other characters, including female genitalia, place it here. Includes: *aureovestita*.



Figs. 63–74.—Subgenus *Scaptia*, mostly females. 63, *brevirostris* (Macq.); 64, *aurata* (Macq.); 65, *auriflua* (Don.); 66, *alpina hardyi*, subsp. nov., showing variation in frons of ♀ and palpi of ♂; 67, *jacksonii* (Macq.), including palp of ♂; 68, *plana* (Walk.); 69, *tricolor* (Walk.); 70, *fulgida* (Ferg. & Henry); 71, *testacea* (Macq.); 72, *monticola*, nom. nov.; 73, *jacksoniensis* (Guér.); 74, *abdominalis* (Ric.).

The limbithorax *Subgroup*.—Medium-sized to large (12–18 mm), oblong, strikingly marked species, with almost uniformly darkened wings, relatively long, narrow palpi (Fig. 50), cell R_5 narrowed, and vein R_4 often with appendix. Three of the species have a dense lateral fringe of conspicuous, pale hairs on the scutum. Includes; *limbithorax, barbara, norrisi, aurinotum.*

The subcana *Subgroup*.—Small species (7–12 mm); usually with radial area of wing darkened; palpi long and narrow (Fig. 53), except in *auranticula* and *orba*, which lead to the *aurata* subgroup; cell R_5 widely open. Includes: *subcana, minuscula, berylensis, auranticula, orba.*

The aurata *Subgroup*.—Medium-sized (10–15 mm), tomentose and hairy species, usually with well-defined abdominal pattern, and with clear wings (spotted in *tricolor*); palpi flattened, pointed, with extensive lateral bare area (Figs. 63–69); cell R_5 widely open or moderately narrowed, rarely closed as an individual aberration. Includes: *brevirostris*, *pulchra*, *aurata*, *auriflua*, *patula*, *alpina*, *jacksonii*, *plana*, *tricolor*.

The testacea *Subgroup.*—Rotund, medium-sized (11–15 mm), brown, unadorned, species, with uniformly lightly greyish or brownish wings, and more or less shining, unadorned abdomen; palpi as in *aurata* group; cell R_5 widely open or somewhat narrowed. Includes: *fulgida*, *jacksoniensis*, *similis*, *testacea*, *abdominalis*, *monticola*.

KEY TO AUSTRALIAN SPECIES OF THE SUBGENUS SCAPTIA

Females

1. Very large (18–24 mm) species, with shining, blackish abdomen, which is marked with conspicuous flecks of white hairs; cell R_5 closed 2
Not such species; cell R_5 nearly always open 4

2. Cell M_3 nearly always closed; scutum brown, with trace of paler dorsocentral lines; wings smoky, with a flavid tint anteriorly. Western Australia ....*singularis* (Macq.)
Cell M_3 nearly always open; scutum dark chocolate to black, with well-defined, pale dorsocentral vittae anteriorly; wings more deeply and irregularly infuscate. Eastern Australia 3

3. A black species; antennae, legs, and beard black ....*guttata* (Don.)
A chocolate brown species; antennae and legs reddish brown, beard cream .... *media* (Walk.)

4. Cell R_5 closed or narrowly open; a large (15–16 mm), golden yellow species; abdomen uniformly covered with golden hairs; legs and base of wing yellow ....*aureovestita* (Ferg. & Henry)
Cell R_5 widely open or moderately narrowed (closed only as a rare individual aberration); other characters not as above 5

5. A striking, medium-sized (12 mm) species, with orange thorax contrasting strongly with brownish black wings ....*aurinotum*, sp. nov.
Species not so adorned 6

6. Large (15–18 mm), black species, with uniformly black abdomen; scutum with conspicuous marginal zone of pale hairs; wings smoky; palpi narrow 7
Not such species 9

7. Lateral zone on scutum white; upper mesopleural hairs black ....*limbithorax* (Macq.)
Lateral zone on scutum orange to yellowish 8

8. Upper mesopleural hairs black ....*barbara*, sp. nov.
Upper mesopleural hairs rich orange to yellowish ....*norrisi*, sp. nov.

9. Frons markedly diverging; palpi subcylindrical, tapering, with small, apical bare area (Fig. 149); a small (9–11 mm), dark, hairy species, with fringes of creamy to golden hairs at apices of abdominal tergites. South-eastern Australia ....*S.* (? *Ps.*) *anomala*, sp. nov.
Frons parallel, rarely slightly diverging; palpi flattened, with extensive lateral bare area; not such hairy species 10

10. Small (8–12 mm), very dark species, with narrow, sabre-shaped palpi (Fig. 53) 11
Not such species 12

11. A uniformly shining black species, with black legs, and the wings deeply clouded on the radial area. Eastern Australia ....*subcana* (Walk.)
A dark brown species, with apical pale bands on the abdominal tergites, reddish brown legs, and the wings lightly smoky. Western Australia ....*minuscula*, sp. nov.

12. Very small (8–10 mm), yellowish species, with uniformly coloured scutum, and a median vitta of golden hairs on at least tergites 3–5 of abdomen 13
    Larger species (10–15 mm); if yellowish, the abdomen is without median vitta of golden hairs 14

13. Radial area of wing suffused with brown; palpi narrow, sabre-shaped (Fig. 54). North Queensland ...... *berylensis* (Ric.)
    Suffusion of wing lighter and more diffuse; palpi wider, tapering (Fig. 55). Western Australia ...... *auranticula*, sp. nov.

14. A small (10 mm), concolorous, yellow species, with scutum and abdomen entirely covered by tomentum, and no brown staining beyond costal cell of wing. South-eastern Australia ...... *orba*, sp. nov.
    Not such species; abdomen either with well-defined pattern or distinctly shining 15

15. Wings darkened anteriorly, and with four well-defined dark spots at *r-m*, *m-cu*, fork of R_{4+5}, and apex of discal cell; proboscis slender, palpi short; scutum vittate, abdomen banded. Western Australia ...... *tricolor* (Walk.)
    Wings without dark pattern or spots 16

16. Tomentose and hairy species; scutum usually with pale vittae; abdomen with well-defined pattern of silky hair or pigment 17
    Less hairy, more concolorous species; scutum with at most traces of vittae, which are not much paler than the ground colour; abdomen shining brown, sub-nude dorsally, without pattern, at most with vague darkening across tergites 24

17. Antennae, palpi, and legs black (sometimes brown in southern specimens); scutum with well-defined vittae and a dense marginal zone of golden to yellow hairs; abdomen with bright pattern of spots or bands 18
    Antennae, palpi, and at least tibiae reddish to yellowish brown 19

18. Ground colour of scutum black; abdomen with discrete median spots and lateral patches of white or golden hair, apical segments entirely golden ...... *auriflua* (Don.)*
    Ground colour of scutum brown; abdomen with bands of bright to creamy yellow hairs on all tergites ...... *patula* (Walk.)*

19. Scutum dark, with faint vittae in front of suture only, and with a complete marginal fringe of conspicuous golden or creamy white hairs; abdomen with a single median vitta or row of spots; rather small species (10–12 mm) 20
    Scutum with well-defined pale vittae (sometimes partly obscured by hair), and lateral pale fringe usually limited to supra- and postalar areas; abdominal markings otherwise 21

20. Marginal fringe of scutum and median abdominal vitta rich golden ...... *pulchra* (Ric.)
    Marginal fringe of scutum and median abdominal spots creamy white ...... *brevirostris* (Macq.)

21. Adornment resembling *S. auriflua*; scutal vittae prominent; abdomen black, with creamy to golden median spots and lateral markings, and apical segments entirely golden; proboscis short and stout, palpi about equal to shaft ...... *aurata* (Macq.)
    Grey or brown species; abdomen differently adorned; proboscis longer and relatively slender, palpi much shorter than shaft 22

22. A grey species, with broad pale scutal vittae, and transversely banded brown and grey abdomen, the paler colour more or less covered by yellowish cream hairs. Western Australia ...... *plana* (Walk.)
    Brown species, with narrow dorsocentral scutal vittae; abdomen brown, with black pattern and more or less extensive spots or bands of creamy to golden hairs. Eastern Australia 23

23. A larger species (usually 12–14 mm); abdomen generally bright brown sublaterally on at least 1st and 2nd tergites, and with pale hairs reduced to apical fringes and small median triangles; 8th sternite as in Figure 92. Tasmania ...... *jacksonii* (Macq.)
    A smaller species (10–12 mm); abdomen usually entirely dark, and with pale hairs forming wider apical bands and an incipient median vitta; 8th sternite as in Figure 91. Victoria and Great Dividing Range ...... *alpina*, sp. nov.

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* See discussion of variants on pp. 60–62.

24. Supra- and postalar scutal tufts dull, not contrasting with adjacent ground colour or hairs . . 25
Supra- and postalar tufts yellowish to white, contrasting with adjacent ground colour and hairs 27

25. Basicosta pale; some of appendages irregularly stained with green; a robust (13–16 mm) species, with cream beard and pleural hairs, creamy yellow to greenish femora, and dark red-brown abdomen, with black and yellow lateral hairs . . . . *jacksoniensis* (Guér.)
Basicosta dark; no trace of green staining 26

26. A robust (13–15 mm) species, like *jacksoniensis*, but with more yellowish beard and pleural hairs, orange-yellow femora, and predominantly red lateral abdominal hairs . . . . *similis*, sp. nov.
A smaller (11–13 mm), duller species, with cream beard and pleural hairs, fawn-cream femora, and brown abdomen, with predominantly yellow lateral hairs . . . . *testacea* (Macq.)

27. Scutum a curious violet-red; abdomen uniformly deep reddish brown; beard, pleural hairs and fringe of scutum ashy or greyish white . . . . *fulgida* (Ferg. & Henry)
Scutum and abdomen less shining, deep to yellowish brown; beard and scutal fringe yellowish or cream 28

28. A more slender, yellowish brown species; beard and posterolateral scutal fringe yellowish cream; basicosta pale; palpi shorter and broader (Fig. 72) . . . . *monticola*, nom. nov.
A more stoutly built, darker brown species; beard and posterolateral scutal fringe pale cream; basicosta dark; palpi generally longer and narrower (Fig. 74) *abdominalis* (Ric.)

The guttata *Group*

SCAPTIA (SCAPTIA) SINGULARIS (Macquart)

Pangonia singularis Macquart, 1846, p. 23. Type ♀, from Australia, stated to be in the Guérin et Reiche Collection; not found in the Paris or British Museums.

Scione singularis (Macquart). Rondani 1863, p. 85; Ricardo 1900*a*, p. 104; Ferguson and Hill 1922, p. 247.

?*Diclisa singularis* (Macquart). Surcouf 1921, p. 113.

Osca singularis (Macquart). Ferguson 1924, p. 256.

Scaptia singularis (Macquart). Ferguson 1926*a*, p. 295.

Scaptia (*Scaptia*) *singularis* (Macquart). Mackerras 1955*a*, fig. 27.

**Pangonia submacula* Walker, 1848, p. 142, 1850, p. 13. Type ♀, from Swan R., W.A., in the British Museum (Natural History).

Erephopsis submacula (Walker). Ricardo 1900*a*, pp. 112, 115; Taylor 1918, p. 56, 1919, p. 42; Surcouf 1921, p. 120; Ferguson 1920, p. 131, 1924, p. 256 (syn. of *singularis* Macquart).

Lilaea submacula (Walker). Enderlein 1925, p. 297.

Erephopsis submedia Ferguson, 1921*a*, p. 365 (lapsus for *submacula* Walker).

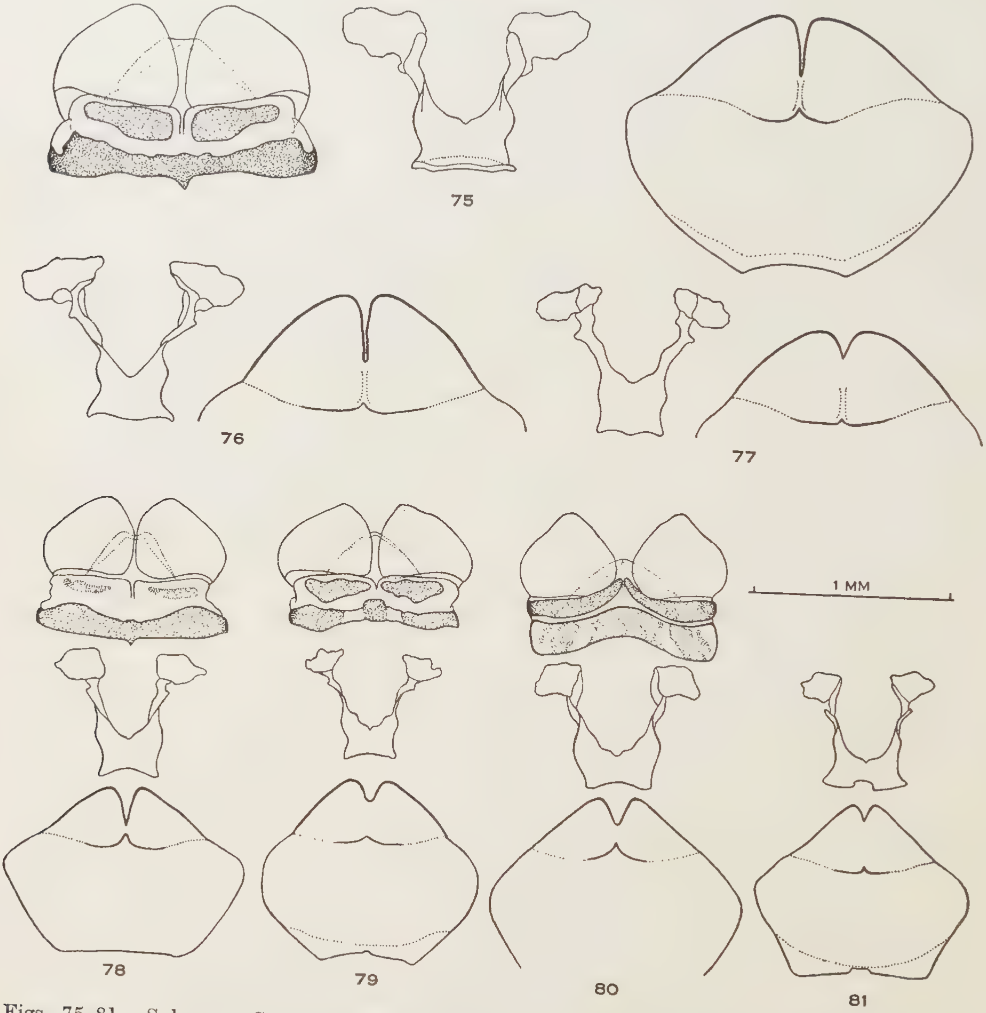
Triclista limbinevris Enderlein, 1922, p. 339, 1925, p. 304, nec Macquart, 1855; Ferguson 1926*a*, p. 304 (corrects misidentification).

Material examined.—2 ♂♂, 57 ♀♀.

A large species, with dark brown scutum, bright brown legs, diffusely infuscated wings, and shining black, white-flecked abdomen. Easily recognizable by the almost consistently closed cell M_3. Length 16–20 mm, most specimens 18 mm or more.

Female (Figs. 31, 45, 76; Plate 2, Fig. 8; Plate 4, Fig. 28)

Head.—Eyes with dense, brown hairs. Frons fawn-brown, fawn-cream along eye margins, with a central convexity, and brown hairs; ocellar tubercle dark grey, with black hairs. Subcallus greyish at eye margins; parafacials pale creamy fawn, with some creamy hairs below level of antennae and a few dark ones near lower margin; face brown with greyish reflections, and with dark brown hairs on either side below antennae. *Antennae*: 1st and 2nd segments light brown, with fairly short, black hairs; 3rd bright orange-brown, variably darkened apically. *Palpi*: 1st segment dark brown, with creamy yellow hairs; 2nd bright brown with an orange tint, and with short dark brown hairs surrounding the paler bare concavity. Beard creamy yellow.



Figs. 75–81.—Subgenus *Scaptia*, female genitalia. 75, *guttata* (Don.); 76, *singularis* (Macq.); 77, *media* (Walk.); 78, *aureovestita* (Ferg. & Henry); 79, *limbithorax* (Macq.); 80, *barbara*, sp. nov.; 81, *norrisi*, sp. nov.

Thorax.—Scutum and scutellum uniformly covered with brown tomentum and dark brown hairs, and frequently with a paler spot at junction of suture and dorsocentral lines; notopleural hairs mainly black; supra- and postalar tufts conspicuous, creamy yellow, the latter extending onto the sides of the scutellum. Pleura grey, with dense creamy yellow hairs, except for a brown patch covering most of the brown upper mesopleural convexity.

Legs.—Bright brown, with predominantly dark brown hairs, but darkening somewhat on hind legs and all tarsi.

Wings.—Smoky, with a flavid hue anteriorly. Veins bright to yellowish brown; stigma inconspicuous; R_4 angulate, with or without short appendix; cell R_5 closed, petiolate; cell M_3 closed, short-petiolate. In one ♀, cell M_3 is narrowly open at the margin in both wings.

Abdomen.—Shining black (sometimes brownish black), with black hairs, and conspicuous flecks of white to cream hair forming median apical triangles on tergites 1–4, lateral triangles on tergites 1, 2, and 4, and lateral patches on tergites 6 and 7; black hair tufts between the lateral white markings dense and conspicuous. Venter shining brownish black, with the lateral white hairs extending ventrally on the 1st segment; an extensive lateral white zone on each side of the 2nd sternite; a pair of small white patches apically on the 3rd and two pairs on the 4th; the extent and arrangement of white flecks is variable.

Male (Figs. 31, 36, 57)

Differs from ♀ in having the beard and pale pleural hairs brighter yellow, and the entire abdomen bright mahogany brown. Eyes with upper facets distinctly enlarged, but merging into small lower and lateral facets. Parafacials fawn-yellow, with dense, dark brown hairs; face more brown than in ♀. Palpi brown, with orange-yellow bare area, and black hairs, except for some creamy yellow ones ventrally on 1st segment. Black marginal hairs between the white lateral tufts on abdominal tergites conspicuous against the brown ground colour.

Distribution.—WESTERN AUSTRALIA: Hovea, Dec., Norris; Mundaring, in dense bush, Clark, Gamblen; National Park, Nov., Burns; Karragullen, Jan., Calaby; Armadale, Jan., Clark, Norris; Waroona, Dec., Berthoud; Yarloop, Nov., Burns; Bowelling, Nov., McIntosh and Calaby; Capel; Busselton, Jan.–Feb.; Nannup, Dec., Swan; Pemberton, Nov., Dec., Feb., Calaby, Norris, Serventy; Bow R., Jan., Norris; Denmark, Jan., Mar., Norris; Nornalup, Dec., Jan., Norris, Swan; Albany, Dec., Newman, Swan; King George Sound. SOUTH AUSTRALIA: An old specimen with no other data, in the Macleay Museum (record doubtful).

Other than that it sucks blood, there are no notes on behaviour.

SCAPTIA (SCAPTIA) GUTTATA (Donovan)

Tabanus guttatus Donovan, 1805, gen. 234, fig.; Macleay 1826, p. 467; Wiedmann 1828, p. 194; Guérin 1831, pl. xx, fig. 10, 1838, p. 289. Described from a ♀ from New South Wales; no type known.

Pangonia guttata (Donovan). Latreille 1812, p. 703; Walker 1848, p. 141; Hine, in Williston 1908, fig. 64; Froggatt 1911, p. 5, figs. 7, 8.

Erephopsis guttata (Donovan). Ricardo 1900*a*, pp. 112, 114, 1915*b*, p. 26, 1917, p. 210; Taylor 1917*a*, p. 746; Ferguson 1920, p. 131, 1921*a*, p. 365; Ferguson and Henry 1920, p. 832; Surcouf 1921, p. 119; Enderlein 1922, p. 341, 1925, p. 296 (wrongly cited as genotype).

Scaptia guttata (Donovan). Ferguson 1926*a*, p. 295, fig. 1; Hardy 1941, p. 233.

Scaptia (*Scaptia*) *guttata* (Donovan). Mackerras 1956*a*, pl. 1, fig. 2.

**Pangonia margaratifera* Wiedemann, 1828, p. 83; Macquart 1848, p. 8. Four cotype ♀♀ in the Berlin Museum, from which Professor F. Peus selected one, labelled "Nov. Holl., Leach, 294" as lectotype, and sent it to me for comparison.

Erephopsis margaratifera (Wiedemann). Rondani 1863, p. 85; Ricardo 1900*a*, pp. 112, 114, 1915*b*, p. 26 (syn. of *guttata* Donovan).

Tabanus bifasciatus Macquart, 1834, p. 201. Type ♀, from Australia, not found in the Paris Museum, but the description fits *guttata* closely.

**Pangonia albonotata* Macquart, 1855, p. 20. Type ♀, from Sydney, in the British Museum (Natural History).

Erephopsis albonotata (Macquart). Ricardo 1900*a*, p. 112, 1915*b*, p. 26 (syn. of *guttata* Donovan).

Lilaea albonotata (Macquart). Enderlein 1925, p. 297.

Pangonia dilatata Jaennicke, 1867, p. 328. Type ♀, from Australia, in the Frankfurt Museum (seen by Dr. C. B. Philip).

Erephopsis dilatata (Jaennicke). Ricardo 1900*a*, p. 112; Surcouf 1921, p. 119. Synonymy in a Ms. note by Ferguson; the description fits *guttata* closely.

Lilaea dilatata (Jaennicke). Enderlein 1925, p. 297.

Material examined.—3 ♂♂, 111 ♀♀.

A very large, robust, black species, flecked with white, and with irregularly infuscated wings. The black beard and propleural and hypopleural tufts distinguish it from *media*. Length 19–24 mm.

Female (Figs. 46, 75; Plate 4, Fig. 29; also Mackerras 1956*a*, Plate 1, Fig. 2)

Head.—Eyes with dense, short, dark brown hairs. Frons dark brown, more greyish above, with a median bare ridge, and dense, dark brown hairs elsewhere; ocellar tubercle blackish grey, with black hairs. Subcallus somewhat paler laterally; parafacials and face darker brown, with dense, blackish brown hairs on parafacials and on either side of face below antennae. *Antennae*: 1st and 2nd segments covered with dark grey to brown tomentum and short, black hairs; 3rd blackish brown, with some greyish reflections. *Palpi*: 1st segment brownish black, with short, deep brown to blackish hairs; 2nd deep to blackish brown, paler apically, with very short, black marginal hairs, and inconspicuous bare area. Beard deep to blackish brown, greyish white posteriorly, where it is continuous with the occipital hairs.

Thorax.—Scutum and scutellum deep to blackish brown, slightly paler laterally, and with well-defined, pale grey dorsocentral lines which end in an expansion at the suture; hairs on disc black, except for white tufts at the anterior ends of the dorsocentral lines, on the pronotal lobes, and on each side in front of scutellum; notopleural hairs jet black, except for small white tuft at upper posterior corner; supra- and postalar tufts dense, creamy white, conspicuous. Pleura dark brown, with deep brown to black hairs everywhere, except for a conspicuous white tuft below and in front of the wing root and a dense white fringe on the upper squame; some of the upper hypopleural hairs are white in a few specimens.

Legs.—Black, with black hairs and bright brown pulvilli and empodia. In one ♀, the hind tarsi are bright yellowish brown.

Wings.—Smoky, with cell *sc* brown, and vague brown clouds elsewhere, particularly across apices of basal cells, but leaving most of basal cells, bases of radial cells, discal cell and cell Cu_2 somewhat clearer. Veins dark brown; stigma dark brown, but inconspicuous; R_4 sinuous, without appendix; cell R_5 closed; cell M_3 variably narrowed, closed at margin in three of the females. In one specimen, there is an aberrant crossvein dividing cell M_3 into two parts.

Abdomen.—Shining black (brownish in old specimens), with black hairs on disc and lateral margins of tergites, except for conspicuous white median patches apically on tergites 1–4, and laterally on tergites 1, 2, 4, 6, and 7. Venter shining black, with black hairs, and with submedian and lateral flecks of white hair on each side at the apical edges of the 2nd to the 4th sternites. The extent and disposition of the white flecks on the abdomen is somewhat variable, both dorsally and ventrally, and their colour sometimes dull creamy white.

Male

Similar to ♀ in coloration and markings. Upper facets of eyes not enlarged. Palpi deep brown to blackish, with deep brown to black hairs, and dark brown bare area.

Distribution.—QUEENSLAND: Eidsvold, Jan., Bancroft; Eumundi; Buderim Mt., Dec.; Blackbutt, Dec.; Woodford, Nov.; Upper North Pine, Dec., McKenzie; Brisbane, Batcheler; Nerang, White. NEW SOUTH WALES: Tooloom scrub, Dec., M. & M.; Dorrigo, Jan., Wright; Deervale, Jan., Mar., Burns; Ebor, Dec., Jan., M. & M., Tillyard (♂); Woollomombi, Jan., E. J. Waterhouse; Armidale, Deuquet; Walcha, Jan.; Wauchope, Feb., Mar., Goodacre, Tillyard; Kew, Jan.; Kendall, Nov., Dec., Jan., Feb., Mar. (Ferguson and Henry 1920); Manning R.; Toronto, Filmer (♂); Awaba, Feb., McMillan; Colo; Sydney (Thornleigh, Lane Cove), Froggatt; Nattai R., Jan., Reilly; Tabourie, Feb., Mar., Hill; Kioloa, Jan.; Durras, Jan., Feb., Mar., Hill and Greaves; Nelligen, Feb., Campbell; Bateman's Bay, Feb., Faulkner; Merimbula, Feb., Wilson. VICTORIA: Nowa Nowa, Feb., E.H. (♂).

This robust and active species is fairly abundant, particularly in forest country; it attacks man, as well as sometimes being a nuisance to stock.

SCAPTIA (SCAPTIA) MEDIA (Walker)

**Pangonia media* Walker, 1848, p. 142. Type ♀, from Australia, in the British Museum (Natural History).

Erephopsis media (Walker). Ricardo 1900*a*, pp. 112, 114, 1915*b*, p. 26; Ferguson and Henry 1920, p. 833; Surcouf 1921, p. 120.

Lilaea media (Walker). Enderlein 1925, p. 297.

Scaptia media (Walker). Ferguson 1926*a*, p. 295.

**Pangonia limbinevris* Macquart, 1855, p. 21. Type ♀, from Sydney, in the British Museum (Natural History).

Erephopsis limbinevris (Macquart). Ricardo 1900*a*, p. 112, 1915*b*, p. 26 (syn. of *media* Walker). Not Enderlein 1922, p. 339, 1925, p. 304 (= *singularis* Macquart).

Material examined.—3 ♂♂, 13 ♀♀ (including 10 in British Museum).

A large species, like *guttata*, but more chocolate brown in colour, and distinguished by the reddish brown legs and antennae, and creamy white beard and hypopleural hairs.

Female (Figs. 47, 77)

Head.—Frons grey, with ashy reflections. Subcallus, parafacials, and face a lighter brown than in *guttata*. *Antennae*: 1st and 2nd segments reddish brown, with some grey overlay and short black hairs; 3rd reddish brown. Palpi with 2nd segment rather light creamy brown, with short, marginal, brown hairs. Beard entirely creamy white.

Thorax.—Scutum and scutellum chocolate brown, with well-defined, grey dorsocentral lines, fading behind the grey suture, and with greyish lateral margins and greyish patches at the hind margin; notopleural hairs black; supra- and postalar tufts creamy white. Pleura brown, with grey reflections above and posteriorly; hairs creamy white, except for a blackish brown zone on posterior part of upper mesopleural convexity and some dark hairs in lower part of hypopleural tuft.

Legs.—Bright reddish brown.

Wings.—As in *guttata*, but not so dark. Vein R_4 without appendix; cell R_5 closed; cell M_3 somewhat narrowed distally.

Abdomen.—Rather shining, dark brown to brownish black; white markings similar to those of *guttata*.

Male

Similar to ♀. Upper facets of eyes distinctly enlarged, clearly separated from lower. Parafacials and face brown, with dark brown hairs. Palpi brown, with greyish overlay, and dark brown to blackish hairs; apical bare area paler. Dark hairs on upper mesopleural convexity more extensive than in ♀.

Distribution.—QUEENSLAND: Upper North Pine R., Jan., C. J. Wild; Brisbane, Sept., Hacker. NEW SOUTH WALES: Kendall, Nov.; Sydney (type loc. of *P. limbinevris* Macq.).

The aurata *Group*

SCAPTIA (SCAPTIA) AUREOVESTITA (Ferguson & Henry)

**Erephopsis aureovestita* Ferguson and Henry, 1920, p. 834. Type ♀, from Kendall, N.S.W., December, in the Australian Museum, Sydney.
Lilaea aureovestita (Ferguson and Hill). Enderlein 1925, p. 297 (lapsus).
Scaptia aureovestita (Ferguson and Henry). Ferguson 1926*a*, p. 295.

Material examined.—2 ♀♀.

A concolorous, bright golden species, with bright brownish yellow legs, and wings somewhat flavid anteriorly. Distinguished from other members of the group by the combination of large size, closed or almost closed cell R_5, and uniform covering of golden hair. Length 15 mm.

Female (Figs. 48, 78)

Head.—Eyes with short yellow-brown hairs. Frons golden brown, with somewhat darker hairs; ocellar tubercle more greyish. Subcallus golden brown, with a patch of fine golden brown hairs above on each side; parafacials and face paler, with light golden hairs. *Antennae*: 1st and 2nd segments light brownish yellow, with golden brown hairs; 3rd orange. *Palpi*: 1st segment covered with yellowish cream tomentum and creamy gold hairs; 2nd bright orange-yellow, with short, golden, marginal hairs. Beard golden yellow.

Thorax.—Scutum and scutellum olive brown, paler anteriorly, the ground colour obscured by a dense covering of long golden hairs, mixed with some black ones; marginal and scutellar hairs golden, notopleural tuft darker than others. Pleura yellowish grey, with dense golden hairs.

Legs.—Bright brownish yellow, with golden hairs.

Wings.—Somewhat smoky, with a yellowish tint anteriorly; veins bright brownish yellow; R_4 without appendix; cell R_5 closed or narrowly open.

Abdomen.—Uniformly bright orange-yellow with a brown tint, and with golden hairs, which are somewhat denser on apical margins of tergites. Venter slightly paler, with creamy gold hairs.

Distribution.—QUEENSLAND: Cedar Creek, Eumundi, Jan., Share. NEW SOUTH WALES: Kendall, Dec. (Ferguson and Henry 1920).

Four specimens only are known, the two recorded above, the type, and another collected in the bush at Lorne, 2 miles from Kendall.

SCAPTIA (SCAPTIA) LIMBITHORAX (Macquart)

**Pangonia limbithorax* Macquart, 1855, p. 22. Type ♀, from unknown country (shown by Ferguson 1924 to be Australia), in the British Museum (Natural History).

Diatomineura limbithorax (Macquart). Ricardo 1900*b*, p. 182; Surcouf 1921, p. 130.

Osca limbithorax (Macquart). Ferguson 1924, p. 260, fig. 1*a*.

Parosca limbithorax (Macquart). Enderlein 1925, p. 278.

Scaptia limbithorax (Macquart). Ferguson 1926*a*, p. 295; Fairchild 1956, p. 20. Austen (in Ferguson 1924) thought at first that this species was Neotropical, and Kröber (1930, 1934) included it in his work on the Neotropical species. Fairchild (1956) re-examined the type, and confirmed Ferguson's conclusion.

**Erephopsis niveovittata* Ferguson and Henry, 1920, p. 833; Ferguson 1924, p. 260 (syn. of *limbithorax* Macquart). Type ♀, from Kendall, N.S.W., March, in the Australian Museum, Sydney.

Lilaea niveovittata (Ferguson and Hill). Enderlein 1925, p. 297 (lapsus).

Material examined.—6 ♀♀.

A striking, black species, with sharply defined stripe of dense white hair on each side of scutum, shining black abdomen, and smoky wings. Length 14–18 mm.

Female (Figs. 49, 79)

Head.—Eyes with short, dense, black hairs. Frons dark grey, with a narrow pale grey line bordering the eyes, and black hairs over the whole length, but concentrated in one dense patch at junction of frons and subcallus and another about one-fourth of the frons length above; ocellar tubercle black. Subcallus pale grey, with some brownish reflections, and with dense black hairs towards its upper margin; parafacials grey, rather shining, with black hairs on whole length; face dark grey, with strong black hairs. *Antennae*: 1st and 2nd segments with grey tomentum and black hairs; 3rd brownish black. *Palpi*: 1st segment greyish black, with black hairs; 2nd dark brown, becoming paler towards tip, and with very short marginal black hairs. Beard black.

Thorax.—Scutum brownish black, with inconspicuous, grey dorsocentral vittae in front of suture, and greyish lateral margins; disc covered with black hairs, and with a conspicuous, dense, continuous zone of strongly contrasting white hairs along the whole of the lateral margin to the scutellar angle. Scutellum blackish brown, with black hairs. Pleura dark grey, with dense tufts of long black hairs.

Legs.—Black, with black hairs.

Wings.—Smoky, slightly darker anteriorly and distally. Veins blackish brown; R_4 without appendix; cell R_5 markedly narrowed.

Abdomen.—Shining black, with some greyish overlay on 1st tergite; hairs black, lateral fringe rather dense. Venter shining black, except for a greyish area at extreme base on each side; hairs all black.

Distribution.—NEW SOUTH WALES: Yarrahappinni, 6 miles SSW. of Scott's Head, Mar., Campbell; Kendall, Mar.; Williams Range, 1200 ft, Mar., McMillan; Gosford; Milson I., Hawkesbury R., Feb.

SCAPTIA (SCAPTIA) BARBARA, sp. nov.

Types.—Holotype ♀, from Carey's Peak, Barrington Tops, N.S.W., on *Leptospermum* flowers, —.ii.1925, S.U. Zool. Exp., in the Macleay Museum, University of Sydney; allotype ♂, from National Park, S. Qld., —.xii.1921, H. Hacker, in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—2 ♂♂, 1 ♀.

A large, striking, black species; distinguished from *limbithorax* by having better defined dorsocentral lines, which extend almost to the posterior margin of the scutum, and the marginal zone of scutal hairs rich golden. The beard and pleural hairs are entirely dark. Length 15–17 mm.

Female (Figs. 50, 80)

Head.—Eyes with dark brown, almost blackish hairs. Frons narrow, grey, with short black hairs, and with almost whole width of upper two-thirds covered with dark brown tomentum; ocellar tubercle black. Subcallus, face, and parafacials grey, with ashy reflections; a small group of short black hairs at upper inner part of subcallus on each side, evenly distributed dark brown hairs on parafacials, and much longer ones on upper half of face. *Antennae*: 1st and 2nd segments with grey tomentum and fairly long black hairs; 3rd brownish black. *Palpi*: 1st segment almost black; 2nd dark brown, paler apically, with fairly short brown hairs. Beard entirely deep blackish brown.

Thorax.—Scutum deep brownish black, with well-defined grey dorsocentral lines, and more indefinite grey lateral margins; lateral zone of dense hairs complete, rich deep golden. Pleura grey, with entirely black hairs, dense on upper zone; squamal tuft black.

Legs.—Black, with more or less of an overlay of greyish tomentum, and black hairs.

Wings.—Evenly suffused with brown; veins dark brown; R_4 angulate, with short appendix; cell R_5 narrowed.

Abdomen.—Black, 1st tergite somewhat greyish; all tergites covered with short black hairs, which are dense on lateral margins. Venter grey, with short black hairs.

Male (Fig. 58)

Similar to ♀, but the scutal vittae less well defined. Eyes with upper facets not at all enlarged. Subcallus, parafacials, and face ashy grey, parafacials and face with long black hairs. Palpi slender, covered with grey tomentum, and with brownish black hairs; bare area dark brown. The legs of the allotype are brown, but the specimen seems to be somewhat immature.

Distribution.—QUEENSLAND: National Park, Dec., Hacker. NEW SOUTH WALES: Bushman Range, Dec., F. Dodd; Barrington Tops (Carey's Peak), Feb., S.U. Zool. Exp.

SCAPTIA (SCAPTIA) NORRISI, sp. nov.

Type.—Holotype ♀, from eastern base of Mt. Bartle Frere, N. Qld., 25.iv.1955, K. R. Norris, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—3 ♀♀, 2 ♂♂ doubtfully allotted.

Close to *barbara*, but distinguished as indicated below. There may be more than two forms in this complex, the northern one about to be described, *barbara* from the high country of south Queensland and northern New South Wales, and a southern coastal form known only from the males at present allotted to *norrisi*.

Female (Fig. 81)

Distinguished from *barbara* by having the palpi somewhat shorter, flatter, and more pointed; the beard almost entirely white; a zone of rich golden to orange hairs on the pleura, covering most of the upper mesopleural and hypopleural convexities and the area between them; creamy golden squamal tuft; vein R_4 more or less angulate, but without appendix; gonopophyses of 8th sternite deeper, more triangular, and base of furca differently shaped (Figs. 80, 81). The pale thoracic hairs of the females from Kuranda and Mirriwinni are dull cream (though not as pale as in *limbithorax*), but they are old specimens, and their colour has probably faded.

Male (Fig. 38)

The two southern males tentatively allotted to this species differ from the females in having the beard, hypopleural and squamal tufts almost entirely dark. They differ from the males of *barbara* in having the upper central facets of the eyes distinctly larger than, and differentiated from, the very small lower facets, a dense zone of rich orange hairs on the upper part of the mesopleural area, and vein R_4 without appendix. The legs are brown in one specimen, black in the other.

Distribution.—QUEENSLAND: Kuranda, F. P. Dodd; Mirriwindi, Feb.; Bartle Frere, Apr., Norris. (♀♀). NEW SOUTH WALES: Gosford; Sydney (Gordon), Jan., Nicholson. (♂♂).

SCAPTIA (SCAPTIA) AURINOTUM, sp. nov.

Type.—Holotype ♀, from Ebor, N.S.W., 13.ii.1940, G. A. Waterhouse, in the Australian Museum, Sydney.

Material examined.—1 ♀.

A distinctive, orange-yellow species, with contrasting dark wings and apical abdominal tergites. Length 12·5 mm.

Female (Fig. 51; Plate 4, Fig. 30)

Head.—Eyes with short but dense light brown hairs. Frons orange-brown, with short golden hairs; ocellar tubercle black. Subcallus bright orange-yellow, without hairs; parafacials and face more brownish yellow, parafacials without hairs, the face with some fine creamy gold ones below antennae on each side. *Antennae*: 1st and 2nd segments creamy yellow, with yellow-brown hairs above, pale gold ones below; 3rd more orange-yellow. Palpi yellow, with light golden hairs, and a deep lateral bare area. Beard bright golden.

Thorax.—Scutum and scutellum yellowish orange, with bright golden hairs, including the barely differentiated marginal tufts. Pleura yellowish orange, with golden hairs, darker on upper mesopleural convexity.

Legs.—Femora orange; tibiae and tarsi yellow; all with golden hairs, which are paler on the tibiae and tarsi.

Wings.—Dark brown, with clear patches in the centre of the discal cell and cell R_4. Veins black, except basicosta, basal section of the costa and base of stem vein, which are orange-yellow, with golden hairs on pale part of costa; R_4 without appendix; cell R_5 slightly narrowed.

Abdomen.—Orange-yellow basally, laterally, and apically, blackish brown on most of distal two-thirds of disc; hairs golden on the pale parts, and brown on the darker. Venter orange, with short golden hairs.

Distribution.—NEW SOUTH WALES: Ebor, Feb., G. A. Waterhouse.

SCAPTIA (SCAPTIA) SUBCANA (Walker)

**Chrysops subcana* Walker, 1848, p. 204. Type ♀, from Australia, in the British Museum (Natural History).

Apocampta subcana (Walker). Ricardo 1901, p. 287; Surcouf 1921, p. 103; Ferguson and Hill 1922, p. 247; Enderlein 1922, p. 336, 1925, p. 268; Hardy 1929, p. 62.

Scaptia subcana (Walker). Ferguson 1926*a*, p. 299, fig. 10.

**Pangonia anthracina* Macquart, 1850, p. 23. Type ♀, from "Tasmanie" (erroneous), in the Paris Museum.

Corizoneura anthracina (Macquart). Ricardo 1900*a*, p. 113; White 1915, p. 18; Surcouf 1921, p. 134; Ferguson and Hill 1922, p. 247 (probable syn. of *subcana* Walker); Enderlein 1925, p. 271.

Apocampta nigra Schiner, 1868, p. 96; Ricardo 1900*a*, p. 99, 1901, p. 287 (syn. of *subcana* Walker). Type ♀, from Sydney, in the Vienna Museum; checked by Dr. M. Beier against recent specimens sent to him for comparison.

**Diatomineura? gagatina* Bigot, 1892, p. 620; Ricardo 1900*a*, p. 113, 1915*b*, p. 33; Taylor 1918, p. 58; Surcouf 1921, p. 130; Ferguson and Hill 1922, p. 247 (syn. of *subcana* Walker). Type ♀, from Australia, in the British Museum (Natural History).

Scaptia gagatina (Bigot). Enderlein 1925, p. 278.

Diachlorus melas Bigot, 1892, p. 625; Ricardo 1904, p. 357 (syn. of *subcana* Walker). Type ♀, from Sydney, not found in the British Museum.

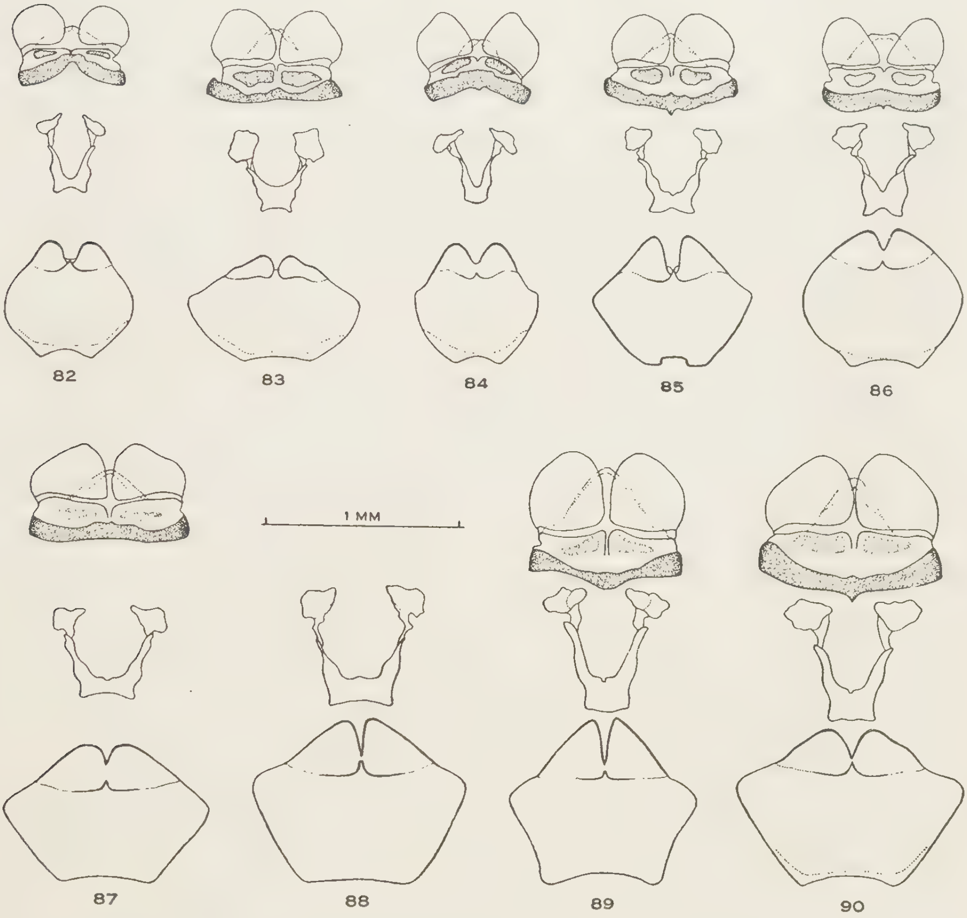
**Diatomineura minima* Ricardo, 1900*a*, p. 119, 1915*b*, p. 33 (syn. of *subcana* Walker); Ferguson 1916, p. 205. Type ♂ ♀, from Sydney or Moreton Bay, eastern Australia, in the British Museum (Natural History).

Material examined.—11 ♂♂, 31 ♀♀.

A small, narrow, parallel-sided, shining black species, with usually greyish white pleural hairs, and smoky wings which are blackened in the radial area. Length 9–12 mm.

Female (Figs. 53, 82)

Head.—Eyes red in life, turning green after death, before darkening to black; with dark brown hairs. Frons rather wide, often somewhat diverging (Fig. 53), deep brown on the upper half, pale grey below, and with a narrow cream strip along the eyes; hairs dark brown, especially dense on the upper half; ocellar tubercle dark brown. Subcallus ashy grey, with a yellowish crescent just above antennae, without hairs; parafacials and face ashy grey, both with white and a few dark hairs. *Antennae*: 1st and 2nd segments with grey tomentum and black hairs; 3rd dark brown, a little brighter towards the base. *Palpi*: 1st segment dark brown, with greyish white hairs; 2nd dark to blackish brown, with pale hairs basally below and short black ones around the slightly depressed brown bare area. Beard creamy to ashy white.



Figs. 82–90.—Subgenus *Scaptia*, female genitalia. 82, *subcana* (Walk.); 83, *minuscula*, sp. nov.; 84, *berylensis* (Ric.); 85, *auranticula*, sp. nov.; 86, *orba*, sp. nov.; 87, *brevirostris* (Macq.); 88, *pulchra* (Ric.); 89, *aurata* (Macq.); 90, *auriflua* (Don.).

Thorax.—Scutum and scutellum shining dark brown, with greyish reflections anteriorly and laterally, and indications of dark brown median and dorsocentral vittae; hairs black; marginal tufts barely differentiated, the supra-alar tuft sometimes with an admixture of white hairs. Pleura grey, with greyish cream hairs.

Legs.—Black; femora with some grey tomentum and greyish white hairs, mixed with black ones on the fore legs; remaining segments with black hairs.

Wings.—Infuscated with brown, and with the radial area deep brown; a rather narrow marginal pale zone from about tip of R_{2+3} to tip of M_3, and centres of cells sometimes paler. Veins dark brown to black; R_4 without appendix; cell R_5 widely open.

Abdomen.—Shining black, with black hairs, except for greyish white zone on 1st tergite and lateral margins. Venter grey, with greyish white hairs, which tend to form fringes at apices of sternites.

The type of *subcana* agrees with the above description. The upper mesopleural tufts, and occasionally the beard, are lemon-yellow to orange in many northern specimens, and the types of *gagatina* and *minima* agree with these. The type of *anthracina* is too dirty for the original colour to be seen.

Male

Similar to ♀, but more thick-set, more hairy, and sometimes more brownish black in colour. Eyes with upper facets somewhat enlarged, though not sharply separated from the small lower facets. Subcallus, parafacials, and face more ashy than in ♀. Palpi slender, with grey tomentum, mixed black and white hairs, and small yellowish brown bare area.

Distribution.—QUEENSLAND: Herberton, Feb. (Brit. Mus.); Little Crystal Creek, Mt. Spec, Nov., Dec., biting, M.J.M.; Magnetic I., Dec., Fielding, Taylor; Brampton I., Jan., Brown, Fawkes; Mackay, Turner; Marwood, Jan., Harvey; Yeppoon, Jan., Common; Rockhampton, Oct., Nov., Wilkinson; Stanthorpe, Dec., J.G. NEW SOUTH WALES: Rous, Sept.; Blue Mts., Jan., Gay; Blackheath, Jan., Pescott and Burns; Green Gully, Dec., McMillan; Sydney (Roseville), Oct., Nov.; Illawarra; Nowra, Jan., Deuquet; Wee Jasper, Jan., Fuller. AUSTRALIAN CAPITAL TERRITORY: Black Mt., Jan., Currie; Cotter R., Dec., Fuller; Blundell's, Jan., Feb., Fuller, Paramonov.

SCAPTIA (SCAPTIA) MINUSCULA, sp. nov.

Types.—Holotype ♀, from Perth, 15.xi.1924, A. J. Nicholson, in the School of Public Health and Tropical Medicine, University of Sydney; allotype ♂, National Park, W.A., 10.xi.1947, A. N. Burns, in the National Museum, Melbourne.

Material examined.—2 ♂♂, 6 ♀♀.

A small, dark brown species, with narrow, paler, apical bands on abdominal tergites, slightly smoky wings, and well-marked stigma. Shape of the palpi suggests relationship with *subcana*. Length 7–9 mm.

Female (Figs. 52, 83)

Head.—Eyes with long, dark brown hairs. Frons parallel, grey, with fawn reflections, and long, dark brown hairs; ocellar tubercle darker. Subcallus, parafacials and face ashy; parafacials relatively wide and bulging, face with an underlying cream hue, both with mixed white and a few black hairs. *Antennae*: 1st and 2nd segments brown, with cream tomentum and dark brown hairs; 3rd dark brown, paler at base. *Palpi*: 1st segment yellowish, with ashy tomentum, and long white hairs; 2nd light yellowish brown, paler apically, and with short brown hairs. Beard ashy white.

Thorax.—Scutum and scutellum dark olive brown, with fairly well-defined, grey median and dorsocentral lines, suture, and lateral area; hairs mixed erect black and semi-recumbent brown; notopleural tuft black; supra- and postalar tufts ashy white. Pleura pale grey, rather densely covered with ashy white hairs, mixed with a few black ones on the upper mesopleural convexity; squamal tuft ashy white.

Legs.—Light brown, darkening on tarsi. Femora with long, ashy to creamy hairs.

Wings.—Somewhat smoky, costal cell brown, indications of a brown suffusion at apices of basal cells; stigma dark brown. Veins brown; R_4 with or without short appendix; cell R_5 widely open.

Abdomen.—Dark brown, blackish brown on apical segments, with lateral part of 1st tergite greyish, and fairly narrow but well-defined light brown bands at the apices of the tergites; hairs short and dark on the darker part, creamy white on apical edges of tergites; marginal hairs alternating white and black, fairly long, but not forming a dense zone. Venter brown; apical edges of sternites paler, all more or less overlaid with a grey dusting; hairs mostly creamy white, somewhat denser on margins of sternites.

Male

Similar to ♀, but more hairy, and possibly somewhat darker (specimens had been relaxed). Eyes with upper facets not enlarged; hairs long, dense, dark brown. Subcallus more protuberant, and 1st antennal segment more swollen than in ♀; parafacials wider, more projecting. Palpi long and slender, light yellowish brown, with elongate apical bare area, and with cream and some black hairs. Wings more darkened in radial area and along veins than in ♀.

Distribution.—WESTERN AUSTRALIA: National Park, Nov., Burns; Perth (King's Park), Nov., Nicholson, Wilson; Waroona, Nov., Wilson.

SCAPTIA (SCAPTIA) BERYLENSIS (Ricardo)

**Corizoneura berylensis* Ricardo, 1915*b*, p. 38; Surcouf 1921, p. 134; Enderlein 1925, p. 271. Type ♀ from Herberton and ♂ from Kuranda, N. Qld., in the British Museum (Natural History).

**Diatomineura crocea* Taylor, 1917, p. 747; Surcouf 1921, p. 130. Type ♂ and ♀, from Kuranda, N. Qld., in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—2 ♂♂, 5 ♀♀.

A small, yellowish species, with yellow-olive scutum, yellow legs, greyish wings, which are considerably darkened in the radial area, and light brown abdomen with a median yellowish stripe. Length 8–9 mm. Recently collected specimens are considerably darker than the types, and are described below.

Female (Figs. 54, 84; Plate 2, Fig. 9; Plate 4, Fig. 31)

Head.—Eyes red in life, turning green after death, before darkening to blackish; with dense, yellowish hairs, more brownish above. It is difficult to understand how Miss Ricardo came to place this species with the bare-eyed forms in "*Corizoneura*". Frons yellow, with a variable orange tint, and brown hairs; ocellar tubercle similar. Subcallus creamy yellow; parafacials more yellowish, with some fine yellow hairs above, stronger black ones below; face with a greyish suffusion, and mixed yellow and black hairs. *Antennae*: 1st and 2nd segments pale creamy yellow, with creamy yellow and black hairs; 3rd bright yellowish basally, blackish on terminal 3 annuli. Palpi light yellowish brown, becoming somewhat darker distally, with creamy hairs on 1st segment and base of 2nd, and short, black hairs surrounding the depressed bare area. Beard creamy yellow.

Thorax.—Scutum and scutellum uniformly covered with yellow tomentum, overlying a more olive ground colour; hairs on disc mixed fine erect black and more recumbent light golden; notopleural tuft mixed black and golden; supra- and post-alar tufts and scutellar hairs forming an almost continuous light golden fringe. Pleura grey, with greyish white hairs below and more yellowish cream ones above.

Legs.—Yellowish, darkening to deep brown on fore and mid tarsi and almost whole of hind tibiae and tarsi; hairs on femora pale creamy yellow, progressively replaced by short dark ones distally on tibiae and tarsi.

Wings.—Greyish, strongly suffused with brown in almost whole of radial area; stigma brown, conspicuous; veins brownish black anteriorly, becoming progressively paler posteriorly; R_4 without appendix; cell R_5 sometimes slightly narrowed.

Abdomen.—Brown, 2nd tergite paler than others; disc with black hairs, and with a series of pale yellowish median triangles, which form a continuous but irregular stripe, covered with light golden hairs, from the posterior part of the 2nd tergite almost to the apex; lateral margins paler, with golden hairs. Venter light brownish yellow, with pale creamy hairs.

Male

Similar to ♀, but more uniformly yellowish. Eyes with upper facets slightly but distinctly enlarged, and clearly separated from the very small lower and posterior facets. First antennal segment more swollen than in ♀, with conspicuous, long, golden hairs. Parafacials and face with dense, long, yellow hairs. Palpi slender, brownish yellow, with paler bare area, and predominantly creamy yellow hairs. Brown coloration of abdomen restricted to apical segments and hypopygium, and median vitta consequently absorbed into the yellow ground colour.

Distribution.—QUEENSLAND: Kuranda, Dodd; Cairns, Dodd; Herberton; Little Crystal Creek, Mt. Spec, Nov., Dec., M.J.M. Two of the Mt. Spec specimens were collected in a motor car, to which they seemed attracted, and the third was found dead in a spider's web.

SCAPTIA (SCAPTIA) AURANTICULA, sp. nov.

Diatomineura pulchra, ♂, Taylor, 1918, p. 59, nec Ricardo, 1915. Taylor described this species as the ♂ of *pulchra*, but it is quite distinct.

Types.—Holotype ♀, "New Holland", 878 IV, in the Vienna Museum; a paratype ♀, with same data, has been lodged in the School of Public Health and Tropical Medicine, University of Sydney; allotype ♂, Karragullen, W.A., 31.xii.1917, J. Clark, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—9 ♂♂, 2 ♀♀. It is curious that the only females seen have been the two old specimens from the Vienna Museum.

A small, yellowish species, resembling *berylensis*, but with wider palpi, vaguely darkened wings, a different pattern of pale hairs on abdomen, and some green staining on appendages. Length 9–10 mm.

Female (Figs. 55, 85)

Head.—Eyes with brown hairs above, creamy below. Frons parallel, or narrowing a little at mid-length, light fawn-yellow, with long, dark brown hairs; ocellar tubercle grey. Subcallus, parafacials and face cream, parafacials and face with cream hairs, mixed with some black ones on the face, which is unusually protuberant in profile. *Antennae*: 1st and 2nd segments light brownish cream, with black hairs; 3rd orange, darkening to black on 8th annulus. Palpi wider than in *berylensis*, of similar form to the *aurata* subgroup, orange-yellow, tipped with green, and with cream hairs, except for a few black ones on dorsal edge. Beard yellowish cream.

Thorax.—Scutum and scutellum dark olive brown, with some greyish overlay anteriorly; hairs on disc black and creamy yellow; notopleural hairs mixed black and orange yellow; supra- and postalar tufts bright creamy yellow. Pleura light grey, with creamy to yellowish hairs, and a few black ones on upper mesopleural convexity.

Legs.—Femora light yellow, with cream and black hairs; remaining segments yellow, darkening to brown on tarsi; hairs mainly black, mixed with some creamy yellow ones on tibiae; knees green, and some green staining on femora and basally on tibiae.

Wings.—Greyish; costal cell light brown, and some brownish suffusion in radial area and along veins, but less marked than in *berylensis*; stigma yellowish brown; veins light brown to yellowish; R_4 without appendix; cell R_5 not narrowed.

Abdomen.—Light brownish yellow, with some irregular black staining in sublateral areas of tergites; hairs black on most of tergites, but a median vitta of bright yellow hairs on 3rd to 5th, and predominantly yellow on lateral margins. Venter yellow, darkened in median zone, apices of sternites paler; hairs yellowish cream, mixed with a few long dark ones medially, and predominantly dark on 6th and 7th sternites.

Male (Fig. 55)

Similar to ♀, but darker, more hairy, and with a better defined median vitta and bright orange-yellow hairs on abdomen (specimens more recent and in better condition). Eyes with upper facets not enlarged, but hairs brown above, creamy below. Subcallus, parafacials, and face somewhat darker than in ♀. First antennal segment with predominantly black hairs, 3rd darkened only at extreme tip. Palpi relatively short, yellowish, becoming orange towards apex, with a large, lateral, apical bare area, and short black and creamy yellow hairs.

Distribution.—WESTERN AUSTRALIA: Karragullen, Dec., Clark; Albany, Dec., Swan; King George Sound; "New Holland" (Vienna Museum).

The green tips to the palpi and staining on the legs suggest that the blood is green, as in *S. jacksoniensis*.

SCAPTIA (SCAPTIA) ORBA, sp. nov.

Type.—Holotype ♀, from Blundell's, A.C.T., 25.xii.1937, I. M. Mackerras, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—1 ♀.

A small, yellow, tomentose species; with orange-yellow 3rd antennal segment, darkened only at extreme tip; somewhat darkened tibiae and tarsi; and faintly greyish wings, with yellowish costal cell and veins. Length 10 mm.

This obscure species seems to be related to *berylensis* and *auranticula*. Its chief distinguishing features are the uniform covering of dense tomentum on scutum and abdomen, and presence of only a few groups of black hairs sublaterally among the yellow ones on the abdominal tergites.

Female (Figs. 56, 86)

Head.—Eyes with dark brown hairs above, cream on lower two-thirds. Frons slightly converging, with light fawn-yellow tomentum, and short, dark brown hairs; ocellar tubercle paler. Subcallus creamy yellow, without hairs; parafacials and face paler, with cream hairs, mixed with a few black ones on sides of face. *Antennae*: 1st and 2nd segments yellowish cream, with cream and some black hairs; 3rd yellowish orange, dark brown at extreme tip. Palpi yellowish, with cream and black hairs. Beard yellowish cream.

Thorax.—Scutum and scutellum densely covered with yellowish fawn tomentum, showing only traces of more yellowish median and dorsocentral lines and lateral areas; with fairly dense yellowish cream and rather sparse erect black hairs; notopleural lobes greyish, with yellowish cream and black hairs; supra- and postalar tufts yellowish cream, not conspicuous. Pleura pale grey, with cream hairs.

Legs.—Coxae like pleura; femora light yellow, with cream hairs, which are mixed with some black ones on fore legs; tibiae and tarsi somewhat darker, becoming brown apically, and with predominantly black hairs.

Wings.—Faintly grey, costal cell brownish yellow; R_1 brown on basal two-thirds, remaining veins yellow; R_4 without appendix, cell R_5 widely open.

Abdomen.—Somewhat discoloured; originally entirely covered with dense, yellow to fawn-yellow tomentum and pale yellow hairs, except for a sublateral patch of black hairs on each side of 1st tergite, and scattered black ones among the yellow sublaterally on other tergites. Venter creamy grey, paler on apices of sternites, and with yellowish cream hairs.

Distribution.—AUSTRALIAN CAPITAL TERRITORY: Blundell's, Dec., I.M.M.

SCAPTIA (SCAPTIA) BREVIROSTRIS (Macquart)

**Pangonia brevirostris* Macquart, 1850, p. 22. Type ♀, from the east coast of New Holland, in the Paris Museum.

Diatomineura brevirostris (Macquart). Ricardo 1900*a*, p. 113, 1915*b*, p. 28, 1917, p. 208; Taylor 1917*a*, p. 748, 1918, p. 59, 1919, p. 42; Ferguson 1916, p. 205, 1920, p. 132, 1921*a*, p. 367; Ferguson and Henry 1920, p. 838.

Scaptia brevirostris (Macquart). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 295, fig. 3.

Material examined.—147 ♀♀.

A small, dark brown species, distinguished by having a dense, postsutural marginal zone of cream hairs on scutum, and a row of small, median, creamy white spots on abdomen; legs yellowish brown. Length 10–12 mm.

Female (Figs. 63, 87)

Head.—Eyes bicoloured, brown above, green below; hairs short, dark brown above, cream below. Frons brown on upper two-thirds, paler fawn-brown on lower third and along eye margins, with short black hairs; ocellar tubercle dark brown. Subcallus fawn-brown, paler at margins and around insertions of antennae, without hairs; parafacials and face fawn-cream, parafacials with cream hairs, face with mainly short black hairs. *Antennae*: 1st and 2nd segments with brownish cream tomentum and black hairs; 3rd orange, darkening at extreme tip. Palpi as long as shaft of proboscis; 1st segment fawn-brown, with white hairs; 2nd light fawn-brown, with reddish brown bare area, and short, inconspicuous hairs. Beard creamy white.

Thorax.—Scutum dark brown, lighter greyish brown anteriorly and laterally, and sometimes with a trace of paler dorsocentral lines in front of suture; hairs on disc black; notopleural hairs black, relatively sparse; supra- and postalar tufts broad and continuous, forming a conspicuous lateral zone, which does not extend beyond the corners of the dark brown scutellum. Pleura light grey, with creamy white hairs, a few darker ones on upper mesopleural convexity, and a small but conspicuous patch of creamy white at its upper posterior corner, just below the wing root.

Legs.—Light yellowish brown, darkening distally on hind tibiae and all tarsi; hairs predominantly cream to yellowish cream on femora, black and yellowish cream on other segments.

Wings.—Faintly brown on disc, slightly darker in costal cell; veins bright brown; R_4 without appendix; cell R_5 widely open.

Abdomen.—Dark brown, almost brownish black on apical tergites; a small, median, triangular, apical patch of creamy white hairs on 1st or 2nd to 4th or 5th tergites, widening on the apical tergites to form a more or less broken apical fringe; margins paler, with lateral, apical fringes of creamy white hairs on 2nd and subsequent segments. Venter grey, apices of sternites yellowish; hairs creamy white, tending to form apical fringes on the sternites. Eighth sternite as in Figure 87.

It is remarkable that no males of this common, widespread species have been collected.

Distribution.—QUEENSLAND: Kuranda, Nov., Burns, Dodd, Taylor; Cairns district, Dodd; Meringa, Oct., Burns; The Boulders, near Babinda, Oct., M. & M.; Beatrice R., biting, Oct., M.J.M.; Crawford's Lookout, biting, Oct., M.J.M.; Wide Bay; Mapleton, Sept., Burns; Montville, Sept., Oct., Burns; Palmwoods, Oct.; Mooloolah, Oct., Dec., Wild; Caloundra, Oct., Wild; Blackbutt, Dec.; Kilcoy, Nov.; Woodford, Nov.; Mt. Tamborine, Dec., May, Davidson, Froggatt; Canungra, biting, Oct., Nov., Bingham, I.M.M.; Cunningham's Gap, biting, Jan., M.J.M.; Binna Burra, biting, Nov., Dec., M. & M.; Springbrook, Dec., M. & M.; National Park, Nov., Dec., Carter, Hacker, M. & M.; McPherson Range, Dec.; Mt. Lindsay, Dec., I.M.M. NEW SOUTH WALES: Tweed R., Nov., Froggatt; Tooloom scrub, Dec., M. & M.; Kyogle; Wiangaree, near Casino; Glenreagh, Dec., F. Dodd; Moonee, Nov., F. Dodd; Brooklana, Dec., Froggatt; Dorrigo, Nov., Dec., Jan., Wright; Meldrum, Nov., Raven; Deervale, Dec.; Armidale, Nov., Raven; Macleay R., Nov., Carter; Comboyne, Dec., Pfeiffer; Kendall, Nov.; Wingham, Nov., Dec., Pfeiffer; Kundebakh, Dennes; Ourimbah State Forest, Nov., Campbell; Gosford, Nov., Ferguson; Mt. Tomah, Nov., Nicholson; Woodford, Nov., I.M.M., Nicholson; Blue Mts.; Illawarra.

SCAPTIA (SCAPTIA) PULCHRA (Ricardo)

**Diatomineura pulchra* Ricardo, 1915*b*, p. 35; Taylor 1917*b*, p. 516; Ferguson 1920, p. 132, 1921*a*, p. 367; Surcouf 1921, p. 131. Type ♀, from Yandina, S. Qld., in the British Museum (Natural History). Not Taylor 1918, p. 59. He described a ♂, from King George Sound, W.A., in the Australian Museum, Sydney, as the allotype of *pulchra*, but it belongs to a different species, which is described above as *auranticula*, sp. nov.

Scaptia pulchra (Ricardo). Ferguson 1926*a*, p. 295; Hardy 1939, p. 41.

Material examined.—48 ♀♀.

A small, striking, black species, with a conspicuous golden margin to scutum, and median golden stripe on abdomen; legs light yellowish. Length 10–12·5 mm.

Female (Fig. 88; Plate 1, Fig. 1)

Head.—Eyes in life with lower two-thirds green, upper third chocolate brown, and a narrow red to golden band between the two colours; hairs short and dark brown above, longer and greyish below. Otherwise as in *brevirostris*, but lower part of frons, parafacials and face paler, palpi shorter, sometimes not reaching middle of proboscis, and beard more yellowish.

Thorax.—Disc of scutum brownish black, anterior and lateral margins and scutellum light grey; hairs black on the darker part, a variable zone of bright gold across the anterior part of the scutum, and a dense marginal zone of bright gold, which also covers the scutellum, giving the insect a very distinctive appearance. Pleura light grey, with dense, rich golden hairs above and sparser creamy gold below.

Legs.—Paler than in *brevirostris*; wings and veins slightly darker.

Abdomen.—Dark to blackish brown, covered with black hairs; and with a broad, median, grey stripe, covered with dense, bright golden hairs, from the posterior part of the 2nd to the 6th tergite; 7th entirely dark; lateral margins grey, with golden hairs. The median stripe sometimes commences on the 3rd tergite, and is often irregular, tending to form confluent triangles. Venter pale grey, apices of sternites paler; hairs creamy gold. Eighth sternite (Fig. 88) larger and more triangular than in *brevirostris*; furca larger; caudal ends of spermathecal ducts longer.

Distribution.—QUEENSLAND: Eungella; Boompa; Yandina (Ricardo 1915*b*); Buderim Mt., Dec.; Blackbutt, Dec.; Bunya Mts., Jan.; Kilcoy, Dec.; Woodford, Dec.; Mt. Nebo, Dec., Derrick, M. & M.; Toowoomba, Dec., Greaves; National Park, Dec., Jan., Carter, Hacker, I.M.M.; McPherson Range, Dec.; Mt. Lindsay, Dec., I.M.M. NEW SOUTH WALES: Dorrigo, Dec., Jan., Wright; Meldrum, Feb., Mar., Raven; Pt. Lookout, near Ebor, in forest, biting, Jan., M. & M.; Barrington Tops (Carey's Peak), Feb., S.U. Zool. Exp.; Eccleston, Jan., Fuller.

SCAPTIA (SCAPTIA) AURATA (Macquart)

**Pangonia aurata* Macquart, 1838, p. 100; Walker 1848, p. 141. Type ♀, from Australia, in the Paris Museum. Not Macquart 1847, p. 12 (= *auriflua* Donovan).

Diatomineura aurata (Macquart). Ricardo 1900*a*, p. 113, 1915*b*, p. 33; Ferguson and Henry 1920, p. 838; Surcouf 1921, p. 130.

Osca aurata (Macquart). Ferguson 1924, p. 261.

Scaptia aurata (Macquart). Ferguson 1926*a*, p. 295, fig. 2; Mackerras 1954, fig. 2*a*. Not Enderlein 1922, p. 338, 1925, p. 278 (= *auriflua* Donovan).

Scaptia (*Scaptia*) *aurata* (Macquart). Mackerras 1955*a*, fig. 27, 1956*a*, pl. 1, fig. 1.

**Pangonia crassa* Walker, 1848, p. 144. Type ♀, from Australia, in the British Museum (Natural History).

Diatomineura crassa (Walker). Ricardo 1900*a*, pp. 113, 120, 1915*b*, p. 33; Ferguson 1920, p. 131; Ferguson and Henry 1920, p. 838. Ricardo (1915*b*) and Ferguson and Henry (1920), although recognizing the synonymy, treated *crassa* as the principal name, the status of *aurata* being restored by Surcouf (1921) and Ferguson (1924).

Scaptia crassa (Walker). Enderlein 1925, p. 278.

**Silvius nitescens* Walker, 1857, p. 124; Ricardo 1901, pp. 296, 297; Surcouf 1921, p. 143. Type ♂, from Australia, in the British Museum (Natural History). The type has lost the 3rd antennal segment and abdomen, but what is left of it agrees well with the ♂ of *aurata*.

Pangonia albicostata Ferguson, 1924, p. 261, nec Macquart, 1846 (= *jacksonii* Macquart).

Material examined.—1 ♂, 17 ♀♀.

An ornate, medium-sized species, with well-defined scutal vittae, a conspicuous pattern of white to golden spots on abdominal tergites, and apical segments entirely golden. Distinguished from *auriflua* by its orange antennae and palpi, and light yellowish brown legs. The ♀ genitalia suggest that it is more closely related to *pulchra* and *brevirostris* than to *auriflua*. Length 12–14 mm.

Female (Figs. 64, 89; Plate 1, Fig. 2; Plate 2, Fig. 10)

Head.—Eyes (relaxed) with indications of a similar pattern to *pulchra*; hairs brown on upper third, paler below. Frons slightly converging, brown on upper two-thirds, greyish above subcallus and on eye margins, with short, black hairs; ocellar tubercle dark grey. Subcallus brown, with paler markings as in *pulchra*, and a few short, black hairs near its upper margin; parafacials and face creamy grey, with cream hairs, mixed with a few dark ones on upper part of parafacials. *Antennae*: 1st and 2nd segments pale fawn, with short, black hairs; 3rd orange-brown, darkening at tip. *Palpi*: 1st segment fawn, with fine, silky, cream hairs; 2nd orange-brown, with a slight reddish tint, and with short, fine creamy hairs on margins and two or three on central area. Proboscis slightly less than head height, stout, with large, firm but unchitinized labella. Beard creamy yellow.

Thorax.—Scutum dark brown, almost blackish in places, and with broad, pale grey median and dorsocentral vittae and lateral areas, the grey suffusing to replace the brown behind the head and in front of scutellum, which is deep brown basally, pale grey distally; the dark areas covered with black hairs, mixed with creamy gold on the anterior fifth of the scutum; notopleural hairs mixed black and creamy gold; supra-alar tuft creamy gold, with a narrow, black zone above; postalar tuft creamy to yellowish gold, extending around the margin of the scutellum. Pleura light grey, with creamy gold hairs and some dark ones on upper mesopleural convexity; squamal tuft creamy gold.

Legs.—Light yellowish brown, darkening distally on fore and mid tarsi and on hind tibiae and tarsi; hairs predominantly creamy gold on femora, predominantly black on tibiae and tarsi.

Wings.—Faintly smoky, with a yellowish tinge anteriorly; stigma yellowish brown; veins brown; R_4 without appendix; cell R_5 usually narrowed; cell M_3 widely open.

Abdomen.—Brownish black, covered with black hairs; with median paler apical triangles or spots covered with bright golden hairs on 2nd to 4th tergites, widening to join a continuous apical band on the 5th, and with subsequent tergites light greyish brown and completely covered with bright golden hairs. In addition, there is a small, lateral, apical patch of brilliant white to creamy white hairs on the 1st tergite, a much larger one extending almost half way to the mid-line on the 2nd, and small ones on the 3rd and 4th. Venter pale grey, with silvery hairs, which tend to form apical fringes on 2nd to 4th sternites, and with golden fringes on subsequent sternites; some black hairs also in median zone.

Male

Described from an old specimen (collected in 1905) in fairly good condition. Coloration and pattern similar to ♀, but lateral hairs on scutum richer orange-yellow. Eyes with upper facets clearly enlarged, though not sharply divided from the lower and posterior small facets; hairs long and brown on upper facets, shorter and paler on the lower ones. Subcallus, parafacials, and face light creamy fawn, with dull cream and a few dark hairs. Palpi slender, light brown, greyish basally, with cream hairs. Legs uniformly light brown. Genitalia exactly like those of *S. patula* (Fig. 37).

Distribution.—QUEENSLAND: Bribie I., Nov., Hacker; Stradbroke I., Dec., Hacker. NEW SOUTH WALES: Tweed R., Nov., Froggatt; Byron Bay, Nov., Marr; Clarence R.; Kendall, Dec.; Broken Bay, Jan., I.M.M.; Kuringai Chase, Jan., Nicholson; Sydney (Lane Cove, Como), Dec., Gay; Jervis Bay, Blackett; Tabourie, Dec., Hill; indecipherable, Feb., Froggatt (♂).

The auriflua–patula *Complex*

The flies to be described here are distinguished by having blackish antennae and palpi; a strongly vittate scutum (sometimes obscured by hair in ♂), with a dense marginal zone of orange to yellowish hairs; black legs; and a strongly patterned abdomen. *S. aurata* has an abdominal pattern like *auriflua*, and the ♂ of *alpina* sometimes resembles *patula*, but both have pale antennae, palpi, and legs, and less conspicuous scutal fringe.

The problem is that there are two, reasonably constant, clearly recognizable forms in the northern half of their range, but several overlapping forms in the south. Southern specimens also tend to have brown antennae and palpi, and, occasionally, brown legs. I have not been able to discover any useful differences in the male or female genitalia, but it seems best to treat the complex as comprising two variable species, which show parallel polymorphism in particular environments. It will be simplest to define the different forms briefly, before proceeding with the detailed descriptions.

auriflua (*Don.*)

Typical (Plate 1, Fig. 3).—A brilliantly marked, black species, with golden scutal fringe, discrete white to yellow spots and patches on 2nd to 4th abdominal tergites, and apical tergites bright golden; parafacials and face ashy to pale grey; squamal tuft usually yellowish to fawn or brown, contrasting with cream hypopleural tuft. North Queensland to Victoria and South Australia (Fig. 27); ?Tasmania.

Form A.—A pale form, with entirely cream to slightly yellowish scutal fringe, abdominal markings, and apical tergites, but pattern as in *auriflua*, not *patula*. Dorrigo Plateau, Shoalhaven R.; Victoria; Tasmania.

Form dives (*Macq.*).—All pale hairs rich, deep golden; markings more diffuse than in typical race, and lateral patches on 3rd and 4th abdominal tergites extending medially to produce a rather characteristic saw-toothed appearance. Victoria; Tasmania; South Australia.

patula (*Walk.*)

Typical Race, Northern (Plate 1, Fig. 4).—A more diffusely patterned, brown species, with duller, yellowish scutal fringe, cream to yellowish apical bands and median triangles on 2nd to 4th abdominal tergites, and apical tergites not as contrasting as in *auriflua*; parafacials and face usually with a yellowish to fawn tint: squamal tuft usually cream, not contrasting with hypopleural tuft. South Queensland (Eukey); northern highlands in New South Wales (Fig. 27).

Southern Race (Plate 1, Fig. 5).—Males as in northern race. Females extremely variable; some like northern race, most intermediate between typical *patula* and *auriflua*, and some indistinguishable from typical *auriflua*, except that the squamal tuft is usually cream, and the median spot and lateral patches on 2nd abdominal tergite tend to fuse. Southern highlands in New South Wales; Victoria; Tasmania.

Form A.—Differs from southern race in having sides of 1st and 2nd abdominal tergites extensively but rather diffusely pale-haired, and a tendency for the median spots on 2nd or 3rd to 4th tergites to become separated in the male. May merge with *auriflua* form A. Blue Mountains, Nowra, southern highlands in New South Wales; Victoria; Tasmania.

Form B.—Similar to form A in markings, but with the rich golden colour of *auriflua* form *dives*, with which it may merge in Tasmania. Only males have been recognized. Victoria; Tasmania.

When these variations became apparent, I thought at first that there were probably two or more nascent species which would hybridize when they met, the kind of explanation that seemed to fit the rather similar situation in the New Zealand species (Mackerras 1957). However, *auriflua* (22 ♂♂, 19 ♀♀) and *patula* (46 ♂♂, 58 ♀♀) occur together on the Dorrigo Plateau and Barrington Tops, without any indication of mixing (other, possibly, than 3 males of *auriflua* form A from near Ebor); and, conversely, there were no *auriflua* males among the 51 from localities in southern New South Wales where 94 varied females were collected. These could be divided into the following categories: 8 resembled typical *patula* or form A; 1 varied towards *auriflua* form *dives*; 79 were intermediate between *patula* and *auriflua*; and 6 resembled typical *auriflua*. It was rather striking in the Australian Capital Territory that true *auriflua* (as judged by males and completely typical females) seemed to be restricted to the plain and isolated smaller mountains, whereas only *patula* and *patula* form A males and variable females were taken at Blundell's, which is not much higher, but close to the main range, and a typical mountain environment.

A recent paper by White and Key (1957) on the *pusilla* group of *Austroicetes* (Acrididae) opens up a fresh possibility. Cytological study showed that they had three distinct, variable species, which did not cross, but of which the phenotypes overlapped considerably. Such an explanation would also fit the facts presented here. Both sexes of at least two of the *auriflua–patula* forms can be collected in numbers within 30 miles of Canberra, so a cytological investigation should be possible in that area.

The adults are most abundant on *Leptospermum* flowers, but typical *auriflua* have also been taken on the smaller epacrids and other wild flowers of the coastal heath. A few north Queensland specimens of *auriflua* were flying around the collector, as if attracted, but did not attempt to settle. Fuller (1936) found the larvae near mountain swamps at Blundell's, Countegany, and Mittagong, and we have collected similar larvae close to a swamp on the Dorrigo plateau.

SCAPTIA (SCAPTIA) AURIFLUA (Donovan)

Tabanus auriflius Donovan, 1805, Gen. 234, fig. Specimen from New South Wales; no type known.

Pangonia auriflua (Donovan). Wiedemann 1828, p. 194; Froggatt 1911, p. 5, fig. 4.

Diatomineura auriflua (Donovan). Ricardo 1900*a*, pp. 112, 119, 1915*b*, p. 27, 1917, p. 208; White 1915, p. 19; Taylor 1917*b*, p. 515, 1919, p. 42; Ferguson 1916, p. 205, 1921*a*, p. 367; Ferguson and Henry 1920, p. 836; Surcouf 1921, p. 130.

Scaptia auriflua (Donovan). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 295; Fuller 1936 (life history, part; material from Mittagong, the material from near Canberra was *patula*); Hardy 1939, p. 41; Lee, Dyce, and O'Gower 1957, pp. 371, 384.

**Pangonia dives* Macquart, 1846, p. 25; Walker 1854, p. 142. Type ♂, from Tasmania, in the Paris Museum. The type ♀ was not found, but the ♂ and a series of "cotype" ♂♂ and ♀♀ all corresponded to the golden Tasmanian form of the species, except one ♀ which belonged to the typical mainland race.

Corizoneura dives (Macquart). Ricardo 1900*a*, p. 113; White 1915, p. 19 (syn. of *auriflua* Donovan).

Scaptia divis (Macquart). Enderlein 1925, p. 278 (lapsus).

Pangonia aurata Macquart, 1847, p. 12, nec 1838. The variety with blackish brown legs recorded from Tasmania was evidently either *auriflua* or *patula*.

Scaptia aurata Enderlein, 1922, p. 338, 1925, p. 278, nec Macquart, 1838. Enderlein designated *aurata* Macquart as type species of *Scaptia*, not knowing that Coquillett had already done so. His specimens (1 ♂, 4 ♀♀) were sent to me by Professor Peus, and proved to be the typical race of *auriflua*.

**Pangonia solida* Walker, 1848, p. 141; Ricardo 1900*a*, pp. 112, 119 (syn. of *auriflua* Donovan). Type ♀, from Port Stephens, N.S.W., in the British Museum (Natural History).

Material examined.—Typical form: 74 ♂♂, 113 ♀♀; form A: 7 ♂♂, 1 ♀; form *dives*: 9 ♂♂, 14 ♀♀.

The most abundant and widespread species of *Scaptia* in Australia. It has been taken in all States, except Western Australia, and in all months from August to May (cf. Fig. 23). Its distinguishing features have been indicated above. Length 11–15 mm, most specimens 12–13 mm.

Typical Form

Female (Figs. 65, 90; Plate 1, Fig. 3)

Head.—Eyes green to blue-green in life, with a variable, orange to red or purple, spectrum-like, transverse band, and variable darker colour above or below; hairs dense, brown above, paler below. Frons grey to pale fawn-cream, with a broad, median, dark brown stripe on upper two-thirds, running into the dark brown ocellar tubercle; hairs black, just extending onto the subcallus, which is ashy to pale fawn-cream, with a brown crescent around the base of each antenna. Parafacials and face ashy to pale fawn-cream, with cream hairs, variably mixed with some black ones. *Antennae*: 1st and 2nd segments with grey tomentum and black hairs; 3rd deep brown to black. Palpi brown to blackish brown, with cream hairs. Beard creamy white.

Thorax.—Ground colour of scutum reduced to four, conspicuous, black vittae by the wide, ashy to greyish median and dorsocentral vittae and lateral areas; the admedian dark stripes end about midway between suture and the pale grey scutellum; hairs on disc black, mixed with some cream to creamy gold at anterior margins; pronotal tuft cream, notopleural, supra- and postalar tufts, and scutellar hairs forming a dense, rich golden, marginal fringe right round scutum, with the notopleural tuft often a darker orange-gold than the rest. Pleura grey, with cream hairs, except for a conspicuous zone of black on upper posterior part of mesopleural convexity; squamal tuft usually yellowish to fawn or brown, darker than the cream hypopleural tuft.

Legs.—Black; femora with some grey tomentum, and predominantly cream hairs; remaining segments with predominantly short black hairs.

Wings.—Clear, slightly greyish; cells at extreme base brown, costal cell not darkened; stigma small, dark brown; veins deep to bright brown; R_4 without appendix; cell R_5 often narrowed at margin.

Abdomen.—First 4 tergites, and often base of 5th, black, with dense, jet black hairs, which give them a rich velvety appearance; discrete, apical, median grey spots, covered with conspicuous white to cream, occasionally yellowish, hair tufts on these tergites, that on 1st smaller than others; conspicuous apical lateral triangles of brilliant white hairs on 1st and 2nd tergites, small ones, hardly intruding on dorsum, on 3rd and 4th. Fifth and subsequent tergites with uniform dense covering of rich golden hairs. *Venter*: first 4 sternites ashy grey, with silvery hairs, except for a variable, median, darker, black-haired patch on 2nd, and more or less extensive, dark, black-haired basal bands on 3rd to 5th; apical part of 5th and all subsequent sternites paler, with dense covering of rich golden hairs.

Male (Plate 1, Fig. 3)

More hairy than ♀, but similarly marked, except that there may be more black hairs on parafacials and face, the beard and pleural hairs are often yellowish, and the median abdominal spots may be light golden. Upper facets of eyes clearly enlarged, usually more than three times the size of the lower facets. Palpi slender, rod-like, covered with grey tomentum, and with long cream to yellowish hairs, except for short black ones round the small, brown, apical bare area.

Distribution.—In view of the variation discussed above, it seems desirable to list the numbers of specimens examined from each locality in New South Wales and from each of the other States. The figures are not complete, because some flies recorded in the totals at the beginning of the descriptions were inadequately labelled.

QUEENSLAND (4 ♂♂, 12 ♀♀): Mackay, ?Sept.; Peri, near Mackay, Nov., Burns; Stony Ck. 23 miles S. of Sarina, flying round 5.30–7.00 a.m., Dec., M.J.M.; Eidsvold, Bancroft; Buderim Mt., Dec., Froggatt; Mooloolaba, in mangroves, Mar., Reye; Brisbane, Sept., Hacker; Stradbroke I., Hacker; Burleigh Heads, Sept., Burns; Springbrook, Mar., M.J.M.

NEW SOUTH WALES: Broadwater, on heath, Sept., M. & M. (1 ♀); Kilgin, Richmond R., Dec., (1 ♀); Boambee, Dec., Wallace (8 ♀♀); 6–12 miles W. of Ebor, on *Leptospermum*, Dec., M. & M. (17 ♂♂, 16 ♀♀); Tamworth, Oct., Froggatt (1 ♂); Kew, Jan. (1 ♀); Barrington Tops (Tubrabucca Ck., Carey's Peak), on *Leptospermum*, Jan., Feb., Common, S.U. Zool. Exp. (2 ♂♂, 3 ♀♀); Eccleston (1 ♀); Nullo Mt., Nov., Dec., Campbell (2 ♂♂); Newcastle (1 ♂); Catherine Hill Bay, Apr., Paramonov (1 ♀); Mt. Irvine, Dec., Plomley (1 ♂, 1 ♀); Mt. Wilson, Jan., Day (1 ♂, 1 ♀); Kurrajong (3 ♂♂, 1 ♀); Blackheath, Jan., Burns and Pescott (1 ♂); Hampton, Jan. (1 ♀); Leura, Mar. (1 ♀); Wentworth Falls, Dec., Taylor (1 ♀); Woodford, Nov., G. A. Waterhouse (1 ♀); Rope's Ck. (1 ♀); Jenolan Caves, 2000 ft, Wiburd (1 ♀); Sydney (Hornsby, Killara, on *Angophora*, French's Forest, Castle Craig, Lane Cove, Kogarah), Nov., Dec., Mar., Day, Froggatt, Gibbons, Grace, Lee, G. A. Waterhouse (6 ♂♂, 7 ♀♀); Ingleburn, Dec. (1 ♂); Illawarra (1 ♀); Bulli Pass, Oct., Dec., Chadwick, I.M.M. (1 ♂, 1 ♀); Cordeaux R., May, Froggatt (1 ♀); Mt. Keira, Walsh (1 ♂); Colo Vale, resting on tree, Nov., Sackelariou (1 ♀); Mittagong, Nov., Dec., Jan. (bred), Fuller, Goldfinch (1 ♂, 2 ♀♀); Burradoo (1 ♂, 1 ♀); Collector, Nov., Paramonov (1 ♂); Jervis Bay. Oct., Paramonov (1 ♂); Mulloon Ck., Feb., Hill (1 ♀); Queanbeyan, Jan., Mahoney (1 ♂); Tabourie, Feb., Mar., Hill (5 ♀♀); Monga, Clyde Mt., Nov., Paramonov (1 ♂, 1 ♀); Durras, Jan., Hill (3 ♀♀); Mannus, Dec., Campbell (2 ♂♂); Moruya, Mar., G.W.C. (1 ♀).

AUSTRALIAN CAPITAL TERRITORY: Weetangerra, Nov., Carne (1 ♂); Black Mt., Dec., Jan., Common, Graham, Rafferty (3 ♂♂, 3 ♀♀); Uriarra, on ti-tree, Dec., Hill (1 ♀); Canberra, Dec., Jan., Feb., Paramonov, Woolcock (1 ♂, 3 ♀♀); Cotter R., Nov., Dec., Paramonov, Willings (6 ♂♂, 4 ♀♀); Tidbinbilla, Dec., Fuller, I.M.M. (1 ♂, 3 ♀♀).

VICTORIA (4 ♀♀); Kinglake, Feb., Burns; Monbulk (British Museum); Wilson's Promontory, Jan., Nicholson.

TASMANIA: An old specimen, labelled "Tasmania", in the Macleay Museum, is a typical ♂, the only one I have seen from the State.

SOUTH AUSTRALIA (2 ♂♂, 4 ♀♀); Glen Osmond, Jan., Cane; Mt. Lofty, Feb., White; Aldgate, Jan., Robinson; Mt. Compass, in tea-tree scrub, Dec., Swan; Cape Jervis, Jan., Lower; no details, old specimen in Macleay Museum.

auriflua *Form A*

Female

Only one agreed in coloration with the males allotted to this race. It is distinguished from typical females by its duller appearance, and from southern females of *S. patula* by the typical *auriflua*-like arrangement of the pale abdominal markings.

Male

Distinguished as stated in the short definitions. Upper facets of eyes as large as in the typical form in the specimens from Ebor, rather smaller in the southern specimens; squamal tuft darker than the hypopleural in all specimens; darker markings on abdominal sternites reduced. The Tasmanian specimen has the lateral patches on 3rd and 4th abdominal tergites yellowish and extending medially like saw-teeth; it may have been derived from the *dives* form.

Distribution.—NEW SOUTH WALES: 6–12 miles W. of Ebor, on *Leptospermum*, Dec., M. & M. (3 ♂♂); Shoalhaven R., Dec., McMillan (1 ♀). VICTORIA (3 ♂♂): Mooroopna, Dec., Wilson; 6 miles W. of Gapsted, Dec., Campbell; Woori Yallock, Dec., Wilson. TASMANIA (1 ♂): Cradle Mt., Feb., Riek.

auriflua *Form* dives (*Macquart*)

Female

Less crisply marked, but more richly coloured than typical form. Face and parafacials often with numerous black hairs; palpi usually brown; disc of scutum often with many dull golden hairs among the black, marginal fringe rich golden; legs sometimes brown, fore femora often with black hairs; median spots on abdominal tergites variable, sometimes quite small, median and lateral spots on 2nd sometimes fusing in mid-line. saw-tooth effect at sides of 3rd and 4th usually well developed; dark basal markings on sternites reduced.

Male

Similar to ♀, but more hairy, and markings often more diffuse; upper facets of eyes not as clearly enlarged as in typical form, more like those of *patula*.

Distribution.—VICTORIA (3 ♀♀): Melton, Dec., Burns; N. Melbourne, Spry; Beech Forest, Jan., Wilson. TASMANIA (7 ♂♂, 11 ♀♀): Wynyard, Feb., Hardy; Devonport, Lea; Erriba, Jan., Riek; Moina, Feb., Riek; Launceston, Dec., Littler, Waldock; Rose's Tier, Jan., Free; 6 miles SW. of Bicheno, Jan., Carne, Kerr, Key; Zeehan, Feb., Hardy; Strahan, Feb., Hardy; National Park, Jan., Riek; Hobart, Jan., Hardy; Mt. Wellington, Jan., Hardy; "V. D. Land", old specimen in Macleay Museum. SOUTH AUSTRALIA (2 ♂♂): Waterfall Gully, Adelaide, Jan., Lower; Mt. Compass, in ti-tree scrub, Dec., Swan.

SCAPTIA (SCAPTIA) PATULA (Walker)

**Pangonia patula* Walker, 1848, p. 144. Type ♂, from unknown country (now known to be Australia), in the British Museum (Natural History).

Diatomineura patula (Walker). Ricardo 1900*a*, pp. 113, 120; Ferguson 1921*a*, p. 367 (possibly not this species, but *auriflua*); Surcouf 1921, p. 131.

Scaptia patula (Walker). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 295; Mackerras 1954, fig. 1*i*, 1955*a*, fig. 1*A–C*.

Scaptia (*Scaptia*) *patula* (Walker). Mackerras 1956*a*, figs. 6*A*, 7*A–C*.

Scaptia auriflua, part, Fuller 1936. As noted above, Miss Fuller's bred specimens from the Australian Capital Territory are this species, and not *auriflua*.

Material examined.—Typical race: 48 ♂♂, 58 ♀♀; southern race: 103 ♂♂, 160 ♀♀; form A: 13 ♂♂, 2 ♀♀ (possibly more); form B: 8 ♂♂.

A duller species than *auriflua*, and more restricted to high country. Length 11–14 mm.

Typical Race

Female (Plate 1, Fig. 4)

Head.—Eyes in life with similar pattern to *auriflua*; hairs dense, brown, somewhat paler below. Frons dull fawn, with dark greyish median mark on upper two-thirds, but less extensive than in *auriflua*; hairs black, extending onto base of subcallus; ocellar tubercle dark brown, with black hairs. Subcallus, parafacials, and face with a yellowish to fawn tint, white hairs, and a variable admixture of black hairs. Antennae and palpi similar to *auriflua*. Beard cream to yellowish cream.

Thorax.—Ground colour of scutum reduced to four dark to greyish brown stripes, as in *auriflua*, but not so conspicuous; hairs on disc mixed black and cream to gold, the latter sometimes predominating; marginal fringe cream to yellowish, duller than in *auriflua*, but with the notopleural tuft darker and sometimes containing an admixture of black hairs. Pleura pale grey, with cream to greyish white hairs, and a zone of black on upper posterior part of mesopleural convexity, as in *auriflua*; squamal tuft usually cream, concolorous with hypopleural tuft.

Legs and *Wings.*—As in *auriflua*, the femora more extensively grey tomentose.

Abdomen.—Tomentose, dark brown to black, with grey apical bands and median triangles; hairs black on the darker parts, cream to yellowish in broad apical bands and median triangles on all segments, those on 5th and subsequent tergites longer, denser, and tending to be more golden than those more basally; the median triangles sometimes tend to separate into spots on the 3rd or 4th tergite. Venter pale grey, with silvery hairs, more yellowish apically, and with narrow, inconstant, dark, black-haired, basal patches on 3rd to 5th sternites.

Male (Fig. 37; Plate 1, Fig. 4)

Similar to ♀, but, as usual, more hairy, the scutal vittae less contrasting and almost obscured by hair, and the abdominal banding better defined. Upper facets of eyes about twice the size of the lower, typically not as enlarged as in *auriflua*. Palpi similar to *auriflua*, but tend to be somewhat paler.

Distribution.—QUEENSLAND (2 ♂♂): Eukey, Jan., Wilson. NEW SOUTH WALES: Ebor, Jan., Fuller (1 ♀); 6–12 miles W. of Ebor, Barwick R., Pt. Lookout, on *Leptospermum*, Dec., Jan., M. & M. (15 ♂♂, 13 ♀♀); Barrington Tops (Gummi R., Tomalla, Tubrabucca Ck., Carey's Peak), on *Leptospermum*, Jan., Feb., Mar., Burns, Common, McMillan, Pescott, S.U. Zool. Exp. (31 ♂♂, 44 ♀♀).

Southern Race

Distinguished by the variability of the females, most of which are rather more like *auriflua* than like northern *patula*. Figures 4 and 5 in Plate 1 show how essentially similar are northern and southern males, but how different the females. The specimens from the Blue Mountains are allotted here provisionally; more collecting will need to be done, before the boundary between the two races can be plotted accurately.

Distribution.—NEW SOUTH WALES: Wentworth Falls, Dec., Taylor (1 ♀); Blue Mts., Jan., Deuquet (3 ♂♂, 1 ♀); Tumut, Feb. (1 ♂); Batlow, Mar., Campbell (1 ♀); Alpine Ck., near Kiandra, Jan., Campbell, Fuller, I.M.M. (21 ♂♂, 19 ♀♀); Tinderry, Jan., I.M.M. (2 ♂♂, 2 ♀♀); Yarrangobilly Caves, Jan., Fuller (2 ♀♀); Jerangle, Jan., I.M.M. (2 ♂♂, 1 ♀); Countegany, Jan., Fuller (2 ♀♀); Kosciusko (Digger's Ck.), Jan., Feb., Chadwick, Nicholson (2 ♀♀). AUSTRALIAN CAPITAL TERRITORY: Blundell's, Nov., Dec., Jan. (bred), Feb., Fuller, I.M.M., Paramonov, Rafferty, Tonnoir (17 ♂♂, 42 ♀♀); Bendora, Feb., Liepa, Paramonov (3 ♀♀); Mt. Gingera, 5500 ft, Jan., Feb., Common, Paramonov (1 ♂, 2 ♀♀). VICTORIA (5 ♂♂, 5 ♀♀): Bright, Davey; Bonang, Jan., Wilson; Alexandra, Jan., Campbell; Evelyn District, Feb., Dixon; Woori Yallock, Dec., Burns, Spry, Wilson; Fern Tree Gully; Inverloch, Jan., Wilson. TASMANIA (2 ♂♂, 3 ♀♀): Scott's Lagoon, Flinders I., Jan., Calaby; National Park, Jan., Riek; Garden I., Dec., Hardy.

patula *Form A*

Usually distinguished most readily in the male, but there is every gradation between this and the southern race, and a possible tendency to merge also with the pale *auriflua* form A. Two females from Blundell's have been associated tentatively with the males on abdominal pattern, and a few others from southern New South Wales may possibly belong here also.

Distribution.—NEW SOUTH WALES: Leura, Jan. (1 ♂); Nowra, Jan., Deuquet (1 ♂); Batlow, Mar., Campbell (1 ♂); Alpine Ck., near Kiandra, Jan., I.M.M. (2 ♂♂); Countegany, Jan., Fuller (1 ♂). AUSTRALIAN CAPITAL TERRITORY: Blundell's, Dec., Jan., I.M.M., Paramonov (1 ♂, 2 ♀♀). VICTORIA (1 ♂): Woori Yallock, Nov., Burns. TASMANIA (5 ♂♂): Launceston, Jan., Hardy; Triabunna, Dec., Hardy; Hobart, Jan., Hardy; Eaglehawk Neck, Jan., Riek; Oakwood, Jan., Carne, Kerr, Key.

patula *Form B*

Male

As defined earlier; the golden lateral hairs mark off a characteristic, median black patch on 1st and 2nd abdominal tergites.

Distribution.—VICTORIA (5 ♂♂): Montrose, Dec., P.B.; Pt. Lonsdale, Feb., Swan; Barwon Heads, Feb., A.H.W.; Gunyah, Dec., A.L.B. TASMANIA (2 ♂♂): Devonport, Lea; Ellendale, Jan., Riek.

SCAPTIA (SCAPTIA) ALPINA ALPINA, subsp. nov.

Types.—Holotype ♀, from Mt. Gingera, A.C.T., about 5000 ft, 17.i.1954, I. M. Mackerras, and allotype ♂, from same locality, 31.i.1952, Z. Liepa, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—20 ♂♂, 18 ♀♀.

A small, brown species, with vittate scutum and banded abdomen. Distinguished from *jacksonii* by smaller size, usually stronger dorsocentral vittae on scutum, more extensively darkened abdominal tergites, and different ♀ genitalia. Length 9–12 mm.

I had regarded this as a mainland race of *jacksonii*, and, indeed, the males are not always separable, but the differences in the ♀ genitalia (Figs. 91, 92), though small, appear to be constant; and small, dark Tasmanian females, which look superficially very like *alpina*, have been found on dissection to have similar genitalia to typical *jacksonii*. On the other hand, it has not been possible to demonstrate genitalic differences between the paler and darker forms of *alpina*, so they are treated as subspecies.

Female (Figs. 59, 91)

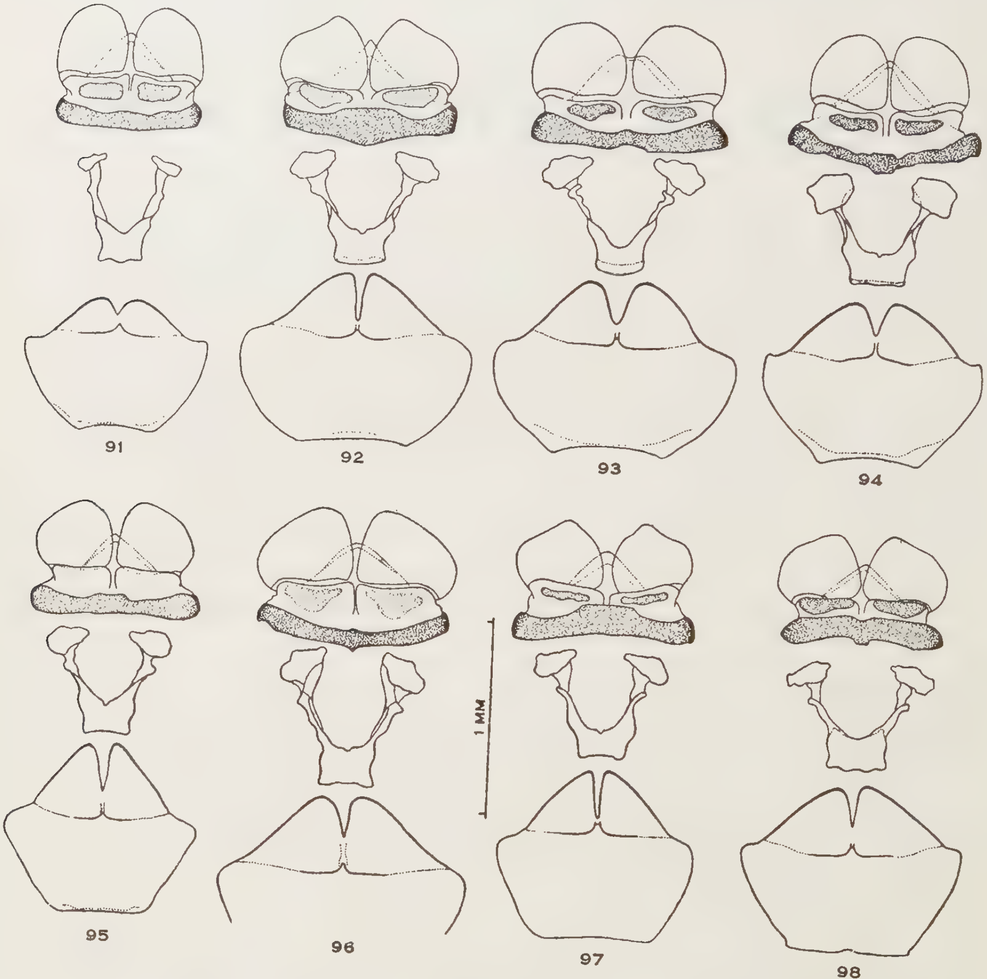
Head.—Eyes with black hairs above, creamy yellow on lower half. Frons fawn-yellow, with variable darker suffusion on upper half, and black hairs; ocellar tubercle dark brown. Subcallus creamy yellow, without hairs; parafacials prominent, creamy yellow, face more variably greyish, both with mixed cream and black hairs. *Antennae*: 1st and 2nd segments light brown, with black hairs; 3rd orange-brown, darkening on apical annuli. Palpi (Fig. 59) longer than usual in *jacksonii*, about half the length of the shaft of the proboscis, but otherwise similar. Proboscis about equal to head height, with large labella. Beard yellowish cream.

Thorax.—Scutum dark brown, with narrow median and wider dorsocentral brownish cream to greyish vittae, fading behind suture, brownish cream on anterior margin and fawn-brown in lateral areas; hairs on disc black erect and dull golden appressed, the latter sometimes predominating; notopleural hairs mixed black and dull golden; supra- and postalar tufts and marginal scutellar hairs yellowish cream. Pleura pale grey, with yellowish cream and a few darker hairs, and a strong yellowish cream tuft below wing root.

Legs.—Femora light brown, tibiae darker, and tarsi darkening to blackish brown distally; hairs black and yellowish cream on femora, predominantly black on remaining segments.

Wings.—Grey, the costal cell slightly darkened, but no brown suffusion beyond it; veins brown; R_4 sinuous, without appendix; cell R_5 slightly narrowed.

Abdomen.—More evidently fasciate than in *jacksonii*, with 1st and 2nd tergites more extensively darkened, the apical bands usually greyish, and the median and lateral triangles less prominent; hairs black on the darker parts, golden to cream on the apical bands, lateral triangles, and median triangles, which are often diffusely extended to form an incipient median vitta. Venter pale grey, with the apices of the sternites paler, and cream hairs, except for some black ones centrally on 5th and 7th sternites. Genitalia with gonopophyses relatively small and cerci rounded.



Figs. 91–98.—Subgenus *Scaptia*, female genitalia. 91, *alpina alpina*, sp. nov.; 92, *jacksonii* Macq.); 93, *plana* (Walk.); 94, *tricolor* (Walk.); 95, *fulgida* (Ferg. & Henry); 96, *jacksoniensis* (Guér.); 97, *monticola*, nom. nov.; 98, *abdominalis* (Ric.).

Male

Similar to ♀ in coloration and markings. Upper facets of eyes insignificantly enlarged. Palpi relatively short and stout, creamy yellow, with cream hairs, except for some black ones round the orange-yellow bare area.

Distribution.—NEW SOUTH WALES: Brindabella, Mar., Hopkins; Alpine Ck., near Kiandra, Jan., Fuller, I.M.M., Willings; Tinderry, Jan., I.M.M.; Yarrangobilly Caves, Jan., Fuller; Kosciusko (Sawpit Ck., Digger's Ck.), Dec., Jan., Feb., I.M.M., Nicholson, Swan, Taylor. A ♀ from Robertson, Mar., Deuquet, in poor condition, may belong to this subspecies. AUSTRALIAN CAPITAL TERRITORY: Mt. Gingera, Jan., Liepa, I.M.M., Riek. VICTORIA: Glen Wills, Feb., Wilson; Bogong High Plain, Jan., Feb., Dobrotworsky, Wilson; Mt. Buller, Jan., Wilson; Lake Mountain, Feb., Wilson.

SCAPTIA (SCAPTIA) ALPINA HARDYI, subsp. nov.

Types.—Holotype ♀ and allotype ♂, from Blackheath, N.S.W., 1.ii.1926, I. M. Mackerras and A. J. Nicholson, in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—7 ♂♂, 6 ♀♀.

Figure 66 is of this subspecies. It differs from the typical subspecies in being yellowish brown in general appearance, with predominantly bright golden hairs; the vittae on scutum almost completely obscured; abdomen with the dark colour reduced to sublateral patches, and the black hairs reduced to form a pair of broad sublateral stripes on the first 3 or 4 tergites, delineated by an interrupted, expanding median vitta and broad lateral zones of bright golden hairs; the apical tergites more diffusely covered with golden hairs. The colour is rather distinctive, but the pattern is variable, and there are intermediates between the subspecies, even in Victoria.

Distribution.—NEW SOUTH WALES: Blackheath, Feb., I.M.M., Nicholson; Wentworth Falls, Dec., I.M.M.; Blue Mts., Jan., Hardy; Burrawang, Dec., R.D.

SCAPTIA (SCAPTIA) JACKSONII (Macquart)

**Pangonia jacksonii* Macquart, 1838, p. 102. Type ♀, from "Port Jackson" (erroneous), in the Paris Museum. Not Walker 1850, p. 15 (? = *guttipennis occidentalis*, subsp. nov.); Ricardo 1900*a*, pp. 112, 117; Ferguson 1916, p. 205; Taylor 1918, p. 58 (all = unidentifiable species from mainland); ?Froggatt 1911, p. 7, fig. 6; Ferguson 1924, p. 258 (both = *maculiventris* Westwood); Enderlein 1925, p. 297 (= *calabyi*, sp. nov.). The identity of this species had been obscure, but the type proved to be a typical specimen of the species hitherto known as *ruficornis* Macquart.

Diatomineura jacksonii (Macquart). Surcouf 1921, p. 130.

**Tabanus albilateralis* Macquart, 1838, p. 129. Type ♀, from "N. Java" (erroneous), in the Paris Museum. I am indebted to Dr. C. B. Philip for drawing my attention to this specimen, which proved to be composite, the body agreeing exactly with *jacksonii*, but with the head of a *Dasybasis* (probably South American) gummed on. It seems best to dispose of the name by including it in the synonymy of *jacksonii*.

**Pangonia albicostata* Macquart, 1846, p. 24; Walker 1854, p. 144. Type ♀, from Australia, in the British Museum (Natural History). Ferguson (1924, p. 261) thought, from the description, that the name was a synonym of *aurata* Macquart, but the type proved to be a typical *jacksonii*.

Diatomineura albicostata (Macquart). Ricardo 1900*a*, p. 113; Surcouf 1921, p. 130.

Scaptia albicostata (Macquart). Enderlein 1925, p. 278.

**Pangonia ruficornis* Macquart, 1846, p. 25; Walker 1854, p. 143. Type ♀, from Tasmania, in the Paris Museum. The species has long been known under this name, but it has sunk so far in the synonymy that an attempt to conserve it would not be justified.

Diatomineura ruficornis (Macquart). Ricardo 1900*a*, p. 113, 1915*b*, p. 29, 1917, p. 208; White 1915, p. 20 (as syn. of *constans* Walker); Ferguson 1921*a*, p. 367 (corrects synonymy); Surcouf 1921, p. 131.

Scaptia ruficornis (Macquart). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 298, fig. 9.

**Pangonia fulvifascia* Walker, 1848, p. 137. Type ♀, supposedly from Cape of Good Hope, in the British Museum (Natural History). This species was accepted as African by Ricardo (1900*a*, pp. 106, 109, *Diatomineura*), Austen (1920, p. 139, *Osca*), Surcouf (1921, p. 130, *Diatomineura*), and Bequaert (1930, p. 885, *Scaptia*). When Mr. Oldroyd began to doubt the African records of *Scaptia* (Oldroyd 1957, pp. 452–6), he sent me the second of Walker's two original females. It agreed well with Tasmanian specimens of *jacksonii*, and the genitalia were identical. The type was later found to agree also.

**Pangonia constans* Walker, 1850, p. 15. Type ♀, from Tasmania, in the British Museum (Natural History).

Diatomineura constans (Walker). Ricardo 1900*a*, pp. 113, 118, 1917, p. 208; White 1915, p. 20; Taylor 1918, p. 61; Ferguson 1920, p. 132, 1921*a*, p. 367 (syn. of *ruficornis* Macquart).

Scaptia constans (Walker). Enderlein 1925, p. 278; Hardy 1940, p. 485.

Material examined.—30 ♂♂, 214 ♀♀.

A somewhat variable, brown species; with orange-brown 3rd antennal segment; short, yellowish brown palpi; narrow scutal vittae; yellowish brown legs; clear or vaguely clouded wings; and a banded abdomen, which usually also has paler median spots. Length 10–14 mm, most specimens 12–13 mm. Known only from Tasmania.

Female (Figs. 60, 67, 92; Plate 2, Fig. 11)

Head.—Eyes with hairs black above, white on lower half. Frons grey, with variable brown darkening on upper two-thirds, and black hairs; ocellar tubercle dark grey to brownish. Subcallus, parafacials, and face cream to ashy; parafacials with creamy white hairs and some black below; face with a variable mixture of black and creamy white hairs, the black often predominating. *Antennae*: 1st and 2nd segments light fawn-brown, with black hairs; 3rd bright orange to almost reddish brown. *Palpi*: 1st segment light fawn-yellow, with creamy white hairs; 2nd short, variable in shape (Fig. 60), creamy yellow marginally, with orange bare area, and with cream hairs variably mixed with black towards tip. Proboscis distinctly longer than head height, moderately stout, and with medium-sized labella. Beard creamy white.

Thorax.—Scutum and scutellum dark brown, with narrow greyish brown median vitta, wider grey dorsocentral vittae, fading behind suture, greyish anterior margins, greyish brown lateral areas, and grey scutellar margin; hairs on disc mixed black erect and dull golden brown appressed; notopleural hairs mixed black and golden brown; supra- and postalar tufts creamy white, conspicuous; marginal scutellar hairs golden brown, not conspicuous. Pleura pale grey, with cream to ashy hairs, some darker ones on upper part of mesopleural convexity, and a conspicuous creamy white tuft below wing root.

Legs.—Bright yellowish brown, darkening somewhat on hind tibiae and all tarsi; femora with variably mixed black and yellowish cream hairs; remaining segments with predominantly black hairs, which are somewhat bristly on tibiae.

Wings.—Greyish, with variable brown suffusion, which is sometimes limited to costal cell, sometimes extends into anterior part of radial area, and occasionally along the veins, or in a vague cloud across apices of basal cells. Veins brown; R_4 sometimes smoothly curved, often angulate, sometimes with short appendix; cell R_5 usually moderately narrowed, sometimes widely open, occasionally closed on wing margin.

Abdomen.—Typically reddish to yellowish brown, with dark brown patches in centre of 1st and 2nd tergites, and dark to blackish brown basal bands, indented by median greyish and lateral yellow-brown triangles, on 3rd to 6th; apical margins of 2nd to 6th and all of 7th variably greyish; hairs black on most of disc, golden to creamy on apical and lateral margins, and usually distinctly paler, sometimes almost whitish, in a series of median spots. Venter grey to light fawn, with apices of sternites paler, and with cream hairs, except for some black ones in centre of 6th and 7th sternites. Genitalia (Fig. 92) with relatively large gonopophyses and truncate cerci.

The dark brown is sometimes reduced to little more than a wide vitta enclosing the median pale triangles, and sometimes so extensive that the abdomen is predominantly dark, except for the sides of the 1st and 2nd tergites. The pale hairs also vary from rich orange-gold to dull cream, or a mixture of the two, and sometimes invade the discs of 1st and 2nd tergites quite extensively. Even when the median spots have predominantly golden hairs, there are nearly always a few cream ones among them.

Male (Fig. 67)

Usually smaller and more hairy than ♀, but similarly marked, and showing the same variations in the extent of dark brown banding and colour of hairs on abdominal tergites. Upper facets of eyes only slightly enlarged, and not differentiated from lower. Palpi short, relatively stout, yellowish cream with, orange bare area, and long, silky, cream hairs, variably mixed with black ones distally.

Distribution.—TASMANIA: Sutton, near Smithton, Jan., Riek; Marrawah, Jan., Carne, Key; Wynyard, Jan., Riek; Oonah, Jan., Riek; Weldborough, Jan., Riek; St. Patrick's R., Jan., Wilson; Mt. Barrow, Jan., Riek; Erriba, Jan., Riek; Moina, Feb., Riek; Waratah, Carter, Lea; Rose's Tier, Jan., Free; Ben Lomond (summit), Jan., Kerr, Key; Cradle Valley, Jan., Tonnoir; Cradle Mt., Jan., Feb., Carter, Hardy, Lea, Riek; Interview R., N. of Pieman R., Dec., Campbell; Pieman Bridge, Jan., Davis; Corinna, Jan., Campbell; Meredith R., Jan., Campbell; Breona, Jan., Riek; Great Lake, Jan., Tillyard; Zeehan, Jan., Feb., Hardy; Remine, Jan., Carne, Kerr, Key; Miena, Jan., Carne, Kerr, Key, Riek; Lake St. Clair, Jan., Feb., Davis, Riek, Tillyard; Mt. Rufus, Jan., Riek; Derwent Bridge, Jan., Chadwick; Steppes, Jan., Riek; Lake Echo, Feb., Tillyard; Strahan, Feb., Carter, Hardy, Lea; King R., Feb., Tonnoir; Dee Bridge, Feb., Tillyard; Tarraleah, Jan., Riek; Gordon R., Jan., Sutton; Triabunna, Jan., Carne, Kerr, Key; Orford, Jan., Carne, Kerr, Key, Riek; Mt. Maria, Maria I., Feb., Hardy; Rheban, biting, Jan., M. & M.; Bagdad Valley, Jan., Davis; Lake Dobson, Jan., Feb., Kerr, Key, Woodward; Russell Falls, Jan., G. A. Waterhouse; National Park, Jan., Harper; Westerway, Jan., Kerr, Key; Florentine R., Jan., Sutton; Adamsfield Track, Jan., Sutton; Sorrel, Jan., Carne, Kerr, Key; Copping, Jan., Carne, Kerr, Key; Mt. Rumney, Dec., Riek; Hobart, Jan., Hardy, Lea; Mt. Wellington, Jan., Feb., Irwin-Smith, Lea, Riek, G. A. Waterhouse; Eaglehawk Neck, Jan., Riek; Oakwood, Jan., Carne, Kerr, Key; Garden I., Dec., Hardy; South Port, Jan., Riek; Leprene, Jan., Carne, Key; Coffin Ck. and Moth Ck., Port Davey, biting late afternoon, Jan., Marks; Cox Bight, Jan., Marks.

SCAPTIA (SCAPTIA) PLANA (Walker)

**Pangonia plana* Walker, 1848, p. 144. Type ♀, from Australia, in the British Museum (Natural History).

Diatomineura plana (Walker). Ricardo 1900*a*, pp. 113, 118, 1915*b*, p. 32; Taylor 1918, p. 61; Surcouf 1921, p. 131.

Scaptia plana (Walker). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 295. It is doubtful whether Ferguson knew this species, but Taylor labelled two females in the Australian Museum correctly.

Diatomineura nigricornis Ricardo, 1915*b*, p. 32; Enderlein 1925, p. 271; nec Bigot, 1892. Miss Ricardo misidentified Bigot's species, which is African, although it was described as from Australia (see under Excluded Species).

Material examined.—6 ♀♀.

A brown and grey species, with orange-brown antennae, light brown palpi, well-defined scutal vittae, clear wings, and transversely banded, brown and grey abdomen. Length 13–14 mm. It falls neatly between the *auriflua–patula* and *alpina–jacksonii* complexes, suggesting a similar pattern of Pleistocene evolution to the examples discussed earlier.

Female (Figs. 62, 68, 93)

Head.—Eyes with brown hairs on upper third, ashy on lower two-thirds. Frons grey, irregularly blackish in centre, with dark brown hairs; ocellar tubercle dark grey. Subcallus light grey, with a light yellowish brown ring around bases of antennae, and a slight intrusion of the frontal hairs above; parafacials and face light grey, with greyish white hairs, mixed with some brown ones on face and lower margin of parafacials. *Antennae*: 1st and 2nd segments light greyish brown, with black hairs; 3rd reddish to yellowish brown. *Palpi*: 1st segment light greyish brown, with long creamy white hairs below; 2nd shaped as in *auriflua*, but less than half the length of the shaft of the proboscis, bright brown, with some very short black hairs above and apically, and some fine white ones ventrally. Proboscis distinctly longer than head height, slender, with relatively small labella. Beard pale cream.

Thorax.—Ground colour of scutum brown, with narrow median grey vitta anteriorly, broad dorsocentral vittae, which expand behind the grey suture and become confluent with the widened median vitta, and broadly grey lateral areas; the appearance is of a grey scutum, bearing four interrupted brown stripes; hairs on disc mixed erect black and appressed dull golden. Notopleural hairs black; supra- and postalar tufts creamy yellow. Scutellum grey, brown at base, with mixed black and creamy yellow hairs. Pleura pale grey, with yellowish cream hairs, mixed with a few dark ones on upper mesopleural convexity.

Legs.—Femora dark greyish brown, paler apically on fore and mid legs; tibiae and tarsi brown, darkening somewhat apically, especially on the hind legs; hairs creamy yellow, mixed with some black ones on femora, short, black, on other segments.

Wings.—Slightly greyish, without darker markings; veins brown; R_4 without appendix; cell R_5 somewhat narrowed.

Abdomen.—Tergites with broad, dark brown basal bands, somewhat indented towards the mid-line and laterally, greyish subapical bands, and narrow greyish cream apical strips; hairs dark brown on the darker parts, and golden on the apical strips, giving the abdomen a strongly crossbanded appearance; marginal hairs not strongly differentiated. Sternites light grey, with dull cream apical bands, and cream to creamy yellow hairs, densest on the paler bands.

Distribution.—WESTERN AUSTRALIA: Albany, Nov., Jan., Grant, Norris, Troughton; King George Sound.

SCAPTIA (SCAPTIA) TRICOLOR (Walker)

**Pangonia tricolor* Walker, 1848, p. 139. Type ♀, from Western Australia, in the British Museum (Natural History).

Erephopsis tricolor (Walker). Ricardo 1900*a*, pp. 112, 117, 1915*b*, p. 23; Taylor 1918, p. 56.

Lilaea tricolor (Walker). Enderlein 1925, p. 297.

Scaptia tricolor (Walker). Ferguson 1926*a*, p. 297.

Pangonia conjungens Walker, 1848, p. 140; Ricardo 1900*a*, pp. 114, 121 (type missing); Surcouf 1921, p. 127 (as *Pangonius*). The type ♀, from Western Australia, has not been found in the British Museum Collection, but the description fits specimens of *tricolor* very well.

Material examined.—36 ♀♀.

A small, dark, distinctive species, with strongly defined grey dorsocentral lines on the scutum, conspicuously spotted wings, and transversely banded abdomen. Length 9–12 mm.

Female (Figs. 61, 69, 94; Plate 4, Fig. 32)

Head.—Eyes with long, dark brown hairs on upper third, creamy white ones below. Frons wide, tending to converge towards antennae, creamy grey, with an underlying rather pinkish hue, and long, black hairs; ocellar tubercle dark brown. Subcallus, parafacials, and face pale brown, covered with ashy to creamy white tomentum; subcallus without hairs; parafacials and face with relatively long and dense hairs, mostly creamy white, but mixed with some black ones medially on face and towards lower margin of parafacials. *Antennae*: 1st and 2nd segments light fawn, with long, black hairs; 3rd reddish to yellowish brown, darkening apically. *Palpi*: 1st segment fawn, with long, silky, creamy white hairs; 2nd yellowish brown, with marginal black hairs and some creamy ones below. Second segment of palp variable in length, usually shorter than half the shaft of the proboscis, which is short, slender, and with small, firm labella (Fig. 61). Beard long, dense, creamy white.

Thorax.—Scutum brown, with a narrow, light greyish brown median line, broad, conspicuous, grey dorsocentral lines, wide, grey marking along suture, and brownish grey lateral margins, in which there are two brownish spots behind the suture; hairs on disc mixed black erect and dull yellowish brown appressed; notopleural tuft brownish black, a tuft of dark brown hairs just behind the suture, and white supra- and postalar tufts. Scutellum brown basally, grey apically, with long black hairs, and some inconspicuous, pale silky ones at margin. Pleura light fawn, with dull creamy hairs, and a zone of dark brown ones towards upper part of upper mesopleural convexity, above which is a conspicuous tuft of white hairs.

Legs.—Light brown, somewhat darker on tarsi; femora with black hairs dorsally, mixed with yellowish ventrally; remaining segments with black hairs, which are longer than usual on tibiae and give them a somewhat bristly appearance.

Wings.—Greyish, with cell at extreme base, costal cell and distal half of cell R_1 brown, and the following darker brown markings: one extending obliquely backwards from R_1 to apex of 1st basal cell; others at apex of 2nd basal cell, apex of discal cell, and fork of R_{4+5}; and fainter spots near tips of R_{2+3}, R_4, and Cu_1+1A. Veins brown; R_4 without appendix; cell R_5 markedly narrowed.

Abdomen.—Blackish brown, with broad, apical, light brown bands on all tergites, expanding laterally to restrict the darker colour on 1st and 2nd; hairs black on the darker areas, light golden on the paler areas, except for a patch of dark hairs at the lateral margin of 2nd tergite; apical fringes of first 3 tergites light golden, 4th white, contrasting, and sometimes a trace of a median, apical, white patch on the 2nd or 3rd; lateral fringes not very conspicuous, mainly light golden, but with distinct white patches apically on the 2nd, 4th, and subsequent tergites. Venter greyish fawn, with golden hairs, and some scattered, longer, black, erect hairs; marginal fringe of 4th sternite white, as on the dorsum.

Distribution.—WESTERN AUSTRALIA: near Muchea, Aug., Calaby; near Bullsbrook, Aug., Calaby; Chidlow's Well, Oct., Giles; Hovea, Sept., Norris; Guildford, Sept., Norris; Glen Forrest, Sept., Ferguson; Perth (Swan R.), Nov., Clark, Newman; Cannington, Sept., Norris; Forrestdale, Sept., Calaby; Jandakot, Oct., Craushaw; 7–19 miles SW. of Beverley, Oct., McIntosh and Calaby; Kelmscott, Cleland; Jarrahdale, Sept., Calaby; Kojonup, Sept., Norris; Greenbushes, Sept., Campbell; SW. district, Sept., Kipps.

SCAPTIA (SCAPTIA) FULGIDA (Ferguson & Henry)

**Diatomineura fulgida* Ferguson and Henry, 1920, p. 837; Ferguson 1921*a*, p. 367. Type ♀, from Kendall, N.S.W., in the Australian Museum, Sydney.

Scaptia fulgida (Ferguson and Henry). Enderlein 1925, p. 278 (wrongly as of Ferguson and Hill); Ferguson 1926*a*, p. 295.

Material examined.—11 ♀♀.

A rather shining, dark brown species, distinguished by the peculiar violet-red hue of the scutum, greyish white beard and pleural hairs, and shining, uniformly deep reddish brown abdomen. Length 12–13 mm.

Female (Figs. 70, 95)

Head.—Eyes with brown hairs above, greyish white below. Frons converging, brown, paler along eye margins, and with short, dark brown hairs; ocellar tubercle dark brown. Subcallus brown, cream at margins; parafacials greyish fawn, with mixed pale and dark hairs on lower part; face brown, with a violet hue, thin covering of grey tomentum, and short brown hairs laterally. *Antennae*: 1st and 2nd segments bright brown, with short black hairs; 3rd orange to reddish brown. Palpi brown with a yellowish tint; 1st segment with long white hairs, 2nd with exceedingly short marginal dark ones.

Thorax.—Scutum and scutellum brown, with a distinct violet-red hue, and with a thin overlay of greyish tomentum, giving it a rather characteristic, hoary appearance; median and dorsocentral vittae faintly indicated; hairs on disc brown, inconspicuous; notopleural hairs mixed brown and greyish white; supra- and postalar tufts and scutellar hairs more creamy white. Pleura pale grey tomentose, with an indication of underlying violet; hairs greyish white anteriorly and below, more creamy white posteriorly and above, a few darker ones on upper mesopleural convexity.

Legs.—Uniformly light brown, with brown to dull golden hairs on all segments.

Wings.—Grey, with a slight brownish suffusion anteriorly and basally. Basicosta light yellowish brown. Veins brown; R_4 without appendix; cell R_5 narrowed.

Abdomen.—Rich brown, vaguely darker on the basal halves of the tergites, and with evenly disposed, short, red-brown hairs covering the whole of the disc; marginal hairs not strongly differentiated, but somewhat brighter and more golden at edges of 4th and subsequent tergites. Venter rich brown, with golden brown hairs on most of sternites, some creamy ones laterally.

Distribution.—NEW SOUTH WALES: Pt. Lookout, near Ebor, Dec., M. & M.; Kendall, Nov.; Wingham, Dec., Pfeiffer; Barrington Tops (4800 ft, Carey's Peak), on *Leptospermum*, Dec., Feb., Salkilld, S.U. Zool. Exp.; Eccleston.

There is a specimen labelled "Meringa, nr. Cairns, Sep., Goldfinch", but the label is not in Goldfinch's handwriting, and its authenticity is doubtful.

SCAPTIA (SCAPTIA) JACKSONIENSIS (Guérin)

Pangonia jacksoniensis Guérin, 1831, pl. xx, fig. 3, 1838, p. 288. Described from a ♀, from Port Jackson, N.S.W., but no type indicated, and none found in the Paris Museum.

Diatomineura jacksoniensis (Guérin). Ricardo 1900*a*, pp. 113, 118, 1915*b*, p. 27; Taylor 1918, p. 58; Surcouf 1921, p. 130.

Osca jacksoniensis (Guérin). Bequaert 1926, p. 193.

Scaptia jacksoniensis (Guérin). Enderlein 1925, p. 278 (misspelt *jaksoniensis*); Ferguson 1926*a*, p. 295.

Material examined.—41 ♂♂, 52 ♀♀.

A stoutly built, rotund species, with brown scutum, yellowish brown basicosta, and deep reddish brown abdomen; femora, and usually antennae or palpi, showing green discolouration. Distinction from *similis* given under that species. Length 13–16 mm.

Female (Figs. 73, 96)

Head.—Eyes in life green with bronze reflections, or the reverse, according to the light; with dark brown hairs above, brownish cream below. Frons brown, darker on upper two-thirds, and with dark brown hairs. Subcallus brown, paler at margins; parafacials greyish cream, with mixed black and creamy hairs along full length; face pale greyish fawn, with blackish hairs on the sides. *Antennae*: 1st and 2nd segments light yellowish brown, with black hairs; 3rd a curious orange-brown, variably stained with green. *Palpi*: 1st segment creamy yellow, with cream hairs; 2nd light yellowish brown, with very fine, black hairs on margins and distally, and often some irregular greenish staining. Beard cream.

Thorax.—Scutum dull brown, with some lighter overlying tomentum, and traces of narrow median and dorsocentral lines; hairs on disc short, black, mixed with a few golden brown ones near suture; notopleural hairs mixed dull cream and black; supra-alar tuft black above, brownish cream below; postalar tuft brownish cream, not contrasting. Scutellum reddish brown, with long, fine, black hairs, and paler silky ones at margin. Pleura creamy grey, with dull cream hairs, mixed with some darker ones on upper part of upper mesopleural convexity.

Legs.—Femora light yellowish cream, variably suffused with pale green, and with mainly pale cream hairs, but also a thin, irregular row of black ones ventrally; tibiae and tarsi light brown, darkening distally; hairs golden brown ventrally, black dorsally.

Wings.—Uniformly greyish, cell at extreme base (but usually not costal cell) somewhat darkened. Basicosta light yellowish brown, occasionally stained green. Veins brown; R_4 without appendix; cell R_5 somewhat narrowed.

Abdomen.—Shining, rich deep reddish brown, darkening on apical tergites, with short, evenly disposed, black hairs on disc; marginal hairs dense, black above, yellow below. Venter shining; 1st and 2nd sternites variably pale yellowish brown, 3rd to 4th or 5th dark brown, apical sternites paler, and 2nd to 5th with pale apical margins; extent of dark brown very variable, and sometimes a greenish hue in the paler parts; hairs cream to yellowish.

Male

Smaller (12–15 mm), paler, and less contrasting than ♀. Eyes with upper facets markedly enlarged; parafacials and face with long, dull yellowish cream and black hairs; palpi short, fawn-cream, with long dull cream hairs and short black ones round bare area. Beard more yellowish cream than in ♀. Scutum with numerous orange-brown hairs among the dark ones, and marginal and pleural hairs somewhat darker than in ♀. Abdomen bright brown, with little darkening, and with relatively long brown and golden brown hairs. Venter paler than in ♀. The appendages show the same green discoloration as the ♀.

One ♂ (Glenreagh, N.S.W., Oct., F.D.), not included in the total, may belong here, but has been relaxed for setting, and is too bedraggled for certain indentification.

Males in this subgroup tend to lack the distinctive coloration of the females, but they may be identified by means of the following key:

1. Upper facets of eyes only a little larger than the lower; supra- and postalar tufts cream, contrasting; basicosta dark .... *abdominalis*
   Upper facets of eyes usually markedly larger than the lower 2
2. Supra- and postalar tufts cream, forming a contrasting posterolateral fringe on scutum; basicosta pale .... *monticola*
   Supra- and postalar tufts dull, not contrasting 3
3. Basicosta pale; a large species (12–15 mm) .... *jacksoniensis*
   Basicosta usually dark; a smaller species (9–13 mm) .... *testacea*

Distribution.—QUEENSLAND: Tibrogargan Ck., Sept., Perkins; Kilcoy, Oct. NEW SOUTH WALES: Glenreagh, Oct., F. Dodd; 7 miles N. of Coff's Harbour, Oct., Carne; from 8 miles E. to 13 miles W. of Ebor, Barwick R., Pt. Lookout, Dec., M. & M.; Tea Gardens, Oct., Carne and Helman; Narara, Oct.; Gosford, Nov.; Bell, Nov., Riek; Hazelbrook, Armstrong; Bellmore Falls, Nov., Paramonov; Tallong, Taylor; Jervis Bay, Oct., Paramonov; Durras, Sept., Paramonov; Nelligen, Nov., Cane, Gemmell; near Bateman's Bay, Oct., Paramonov; Pambula, Dec., Riek. VICTORIA: Drummer Mt., Dec., Riek.

S. jacksoniensis is attracted to man; it is shy, but will feed if the observer remains quiet. A few females have also been taken on *Leptospermum* flowers. It appears to be the only member of the subgroup with green blood (cf. *S.* (*S.*) *minuscula*).

SCAPTIA (SCAPTIA) SIMILIS, sp. nov.

Type.—Holotype ♀, from Surprise Rock, Binna Burra, S. Qld., 14.xi.1952, I. M. Mackerras in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—13 ♀♀.

A robust species, superficially like *jacksoniensis*, but distinguished by the yellowish beard, pleural ground colour, and pleural hairs, orange-yellow legs, complete absence of green staining, largely black basicosta, more markedly narrowed cell R_5, and reddish lateral fringe of abdomen. To be separated from *testacea* by larger size, rich reddish brown abdomen, and differently coloured beard, pleura, pleural hairs, and lateral abdominal hairs. Length 13–15 mm.

Female

Head.—Eyes with dark brown hairs above, pale yellow below. Frons yellow-brown, with dark brown hairs. Subcallus yellowish fawn, vaguely brown on each side of mid-line; parafacials light yellowish fawn, with pale yellow and dark brown hairs; face with a more greyish tint, and short, black hairs. *Antennae*: 1st and 2nd segments light yellowish brown, with black hairs; 3rd rich orange. *Palpi*: 1st segment light fawn-yellow, with pale yellow hairs; 2nd bright orange-brown, with short, black marginal hairs. Beard creamy yellow.

Thorax.—Scutum brown, more yellowish fawn anteriorly and laterally, with traces of median and dorsocentral lines; hairs on disc dark brown, erect, and some brown-gold appressed; notopleural hairs mixed black and yellowish brown. Supra- and postalar tufts light yellowish brown, not strongly contrasting. Scutellum more reddish brown than scutum, with fawn-yellow margin, and black hairs on disc, yellow-brown marginally. Pleura light fawn-yellow, more greyish below, with creamy yellow and yellow-brown hairs above, more creamy below.

Legs.—Almost uniformly light orange-yellow, with golden brown to yellowish hairs, a few black ones ventrally on fore femora, some short black ones dorsally on fore and mid tibiae and tarsi, and a stronger red-brown and black dorsal fringe on hind tibiae and tarsi.

Wings.—Greyish, costal cell and cell at extreme base distinctly yellowish. Basicosta brownish black, except for light yellow-brown patch at base. Veins bright to yellowish brown; R_4 without appendix; cell R_5 markedly narrowed, closed at margin in two specimens.

Abdomen.—Shining rich red-brown, apical tergites not as darkened as is usual in *jacksoniensis*; hairs on disc black, marginal hairs rich red to red-gold, mixed with some brighter brown-gold at apical corners of some of the tergites; in some specimens, there is an incipient red-gold apical fringe on 3rd to 5th tergites, and more diffuse red-gold hairs on 6th and 7th. Venter shining bright yellowish brown, irregularly darkened, especially in centres of sternites, with golden to golden brown hairs, and sometimes a few black ones centrally on 5th and subsequent sternites.

Distribution.—QUEENSLAND: Eungella; Brookfield, Nov., Hacker; Binna Burra, biting, Nov., I.M.M.; McPherson Range, 3000 ft, Dec. NEW SOUTH WALES: Repton, in forest, Oct., Dare; Comboyne, Dec., Pfeiffer; Durras, Jan., Hill and Greaves; Eden, Jan., Piggott.

The females collected at Binna Burra were mistaken for *jacksoniensis* in the field. They spent a great deal of time flying round very fast, with a rather deep hum, and usually settled on the upper part of the body, in contrast with *S.* (*M.*) *bancrofti*, which approached unobtrusively, and always settled on the boots or ankles.

SCAPTIA (SCAPTIA) TESTACEA (Macquart)

**Pangonia testacea* Macquart, 1838, p. 99; Walker 1854, p. 145. Type ♀, from Australia, in the Paris Museum.

Diatomineura testacea (Macquart). Ricardo 1900*a*, p. 113, 1915*b*, p. 31, 1917, p. 209; Taylor 1917*b*, p. 516, 1918, p. 61; Ferguson 1920, p. 131; Ferguson and Henry 1920, p. 836; Surcouf 1921, p. 131.

Scaptia testacea (Macquart). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 295.

Material examined.—6 ♂♂, 44 ♀♀.

A fairly uniformly brown species; with relatively long, thin palpi; cream to yellowish cream beard and pleural hairs; scutal tufts not contrasting; creamy yellow legs; brownish black basicosta; and brown abdomen, with yellow to orange-yellow lateral hairs. Length 11–13 mm (one ♂ 9 mm).

Female (Fig. 71)

Head.—Eyes green in life; with brown hairs above, creamy white below. Frons brown, paler on lower third, with dark brown hairs. Subcallus brown, paler on margins, occasionally with some short, dark hairs extending down from frons near mid-line; parafacials and face yellowish to creamy fawn, with mixed dark brown and cream hairs. *Antennae*: 1st and 2nd segments light brown, with some greyish tomentum, and short, black hairs; 3rd orange-brown, darkening apically. *Palpi*: 1st segment creamy brown, with cream to yellowish cream hairs; 2nd brown, paler apically, with short, black marginal hairs. Beard yellowish cream.

Thorax.—Scutum and scutellum dull brown, paler anteriorly and laterally, with traces of dorsocentral lines; hairs on disc predominantly bright brown; notopleural hairs mixed light and dark brown, supra-alar tuft creamy brown, not conspicuous, postalar tuft and marginal scutellar hairs light brown. Pleura light fawn-grey, with cream to yellowish cream hairs, distinctly duller and paler than in *similis*.

Legs.—Femora light creamy yellow, remaining segments, especially hind tibiae and tarsi, somewhat darker; hairs pale yellow on femora, yellow ventrally, black dorsally on remaining segments, except for some brown-gold in hind tibial fringes.

Wings.—Grey, costal cell, cell at extreme base, and sometimes part of radial area more or less suffused with brown. Basicosta brownish black; veins brown; R_4 without appendix; cell R_5 slightly narrowed.

Abdomen.—Bright brown, slightly paler basally, and with vague, somewhat darker markings on 2nd and subsequent tergites; hairs on disc uniformly golden brown in northern specimens, but with a variable admixture of black in southern ones; marginal hairs bright yellow to orange. Venter shining light brownish yellow, with centres of some sternites vaguely darkened, and apices of 2nd to 6th paler; hairs pale yellow.

Male

Smaller, generally paler, and more hairy than ♀. Upper facets of eyes markedly enlarged. Palpi slender, light creamy fawn, with orange-brown bare area, and mixed black and yellowish cream hairs. Two ♂♂ from Buderim Mt., S. Qld., have the upper facets of the eyes less enlarged than usual and the basal abdominal tergites pale, translucent yellow, but are typical in other respects.

Distribution.—QUEENSLAND: Kuranda, Nov., Dodd, Taylor; Beatrice R., biting, Oct., M.J.M.; Crawford's Lookout, biting, Oct., M.J.M.; Coolum, Sept., Burns; Maroochydore, Oct., Burns; Buderim Mt., Dec., Froggatt; Brisbane, Oct., Hacker. NEW SOUTH WALES: Kendall, Nov.

Most specimens have been taken when attempting to feed on the collector; they approach more quietly than *similis*. The Kendall specimens, though larger than average (12 and 13 mm), agree with northern ones and not with *similis*.

SCAPTIA (SCAPTIA) ABDOMINALIS (Ricardo)

**Diatomineura abdominalis* Ricardo, 1917, p. 209; Ferguson 1920, p. 132; Ferguson and Henry 1920, p. 836; Surcouf 1921, p. 130. Type ♀, from Laurieton, N.S.W., October, in the British Museum (Natural History).

Scaptia abdominalis (Ricardo). Ferguson 1926*a*, p. 295.

Material examined.—5 ♂♂, 22 ♀♀.

A stoutly built, dark brown species, distinguished by having conspicuous, cream supra- and postalar tufts, and blackish brown basicosta. Length 13–14 mm.

Female (Figs. 74, 98)

Head.—Eyes with brown hairs above, cream to whitish below. Frons fawn-brown, paler on lower third, with dark brown hairs. Subcallus brown, paler at margins; parafacials pale fawn-cream, with sparse brown and a few pale hairs; face more greyish, with strong brown hairs and some fine cream ones laterally. *Antennae*: 1st and 2nd segments light brown, with cream tomentum and black hairs; 3rd orange-brown. *Palpi*: 1st segment yellowish cream, with cream hairs; 2nd long, of medium width, orange-brown, paler apically, with short marginal dark brown hairs. Beard cream.

Thorax.—Scutum and scutellum dark brown, somewhat paler anteriorly and laterally, with at most very faint traces of dorsocentral vittae; hairs on disc mixed black erect and bright brown recumbent; notopleural hairs black and brownish cream; supra- and postalar tufts dense, cream, strongly contrasting; marginal scutellar hairs light brown. Pleura pale grey, with white hairs below, mostly cream above and posteriorly, but with a brownish hue in the dense tuft below wing root.

Legs.—Femora light yellowish brown, remaining segments of fore and mid legs brighter brown, hind tibiae and tarsi distinctly darker; hairs cream, with some black ones on femora, black dorsally, yellow-brown ventrally on other segments.

Wings.—Uniformly greyish, usually not darkened in costal cell or at extreme base. Basicosta blackish brown. Veins brown; R_4 without appendix; cell R_5 moderately narrowed.

Abdomen.—Shining brown, vaguely more reddish or darker on parts of tergites, and with their apices somewhat paler; hairs predominantly black on disc, bright creamy yellow on sides of 1st and 2nd tergites, lateral margins of others, and in incipient median apical patches on 3rd to 5th or 6th. Venter shining creamy yellow, the middle sternites variably darkened, but their apical margins paler; hairs cream, except for some black ones in median area of 5th and subsequent sternites.

Male

Similar to ♀ in coloration, except that the upper mesopleural hairs have a more yellow-brown colour, and those on abdomen are predominantly russet. Eyes with upper facets only slightly enlarged, not clearly differentiated from the small lower and lateral facets. Palpi slender, fawn-cream, with orange-brown bare area, and cream to pale brownish hairs.

Four females from the Bogong High Plain, Victoria, Dobrotworsky, are unusually large (15–16 mm), and resemble *jacksoniensis* in the rich mahogany colour of the abdominal tergites. However, the scutal fringe is normal, the basicosta entirely black, and there is no trace of green discolouration, so they are probably correctly placed here.

Distribution.—QUEENSLAND: Noosa Heads, Oct., Burns; Brisbane, Sept., Hacker. NEW SOUTH WALES: Maclean, Taylor; Armidale, Deuquet; Kendall, Nov.; Laurieton, Oct.; Wingham, Nov., Pfeiffer (a bedraggled ♀, but probably belongs here). VICTORIA: ?Mallee; Bright, Davey; Alps, Davey; Bogong High Plain, Feb., Dobrotworsky; Woori Yallock, Dec., Wilson; Bunyip; Beech Forest, Jan., Mar., Fyfe, Wilson.

SCAPTIA (SCAPTIA) MONTICOLA, nom. nov.

**Diatomineura montanus* Ricardo, 1915*b*, p. 34. Type ♀, from Katoomba, N.S.W., in the British Museum (Natural History). Preoccupied by *Pangonia* (*Corizoneura*) *montana* Hutton, 1901, New Zealand, the type of which is a *Scaptia* (*Pseudoscione*) (Mackerras 1957, p. 593).

Diatomineura montana Ricardo. Taylor 1917*b*, p. 516; Ferguson 1920, p. 131, 1921*a*, p. 367; Ferguson and Henry 1920, p. 837; Surcouf 1921, p. 131.

Scaptia montana (Ricardo). Ferguson 1926*a*, p. 295.

Material examined.—8 ♂♂, 61 ♀♀.

A relatively slender, yellowish brown species, with yellowish cream supra- and postalar tufts forming a well-defined posterolateral fringe on scutum. Distinguished from *abdominalis* by lighter build, more yellowish colour, usually shorter, wider palpi, pale basicosta, and more widely open cell R_5. Length 11–13 mm.

Female (Figs. 72, 97)

Head.—Eyes with brown hairs above, cream below. Frons brown, darker on upper two-thirds, and paler at eye margins, with brown hairs. Subcallus, parafacials, and face brown to creamy brown; hairs on parafacials and face light brown, those on parafacials restricted to lower part. *Antennae*: 1st and 2nd segments creamy brown, with brown hairs; 3rd bright yellowish brown. *Palpi*: 1st segment creamy brown, with yellowish cream hairs; 2nd relatively short and wide, but somewhat variable, dull orange-brown, with light brown hairs. Beard yellowish cream.

Thorax.—Scutum and scutellum almost uniformly bright brown, with brown hairs; notopleural hairs mixed brown and yellowish cream; supra- and postalar tufts yellowish cream, forming a conspicuous, lateral zone to the scutum behind the wing; marginal scutellar hairs brown. Pleura creamy fawn, with yellowish to creamy yellow hairs.

Legs.—Light yellow, with mainly yellowish cream hairs, except for brown dorsal zone on hind tibiae and tarsi.

Wings.—Almost clear, costal cell, and sometimes basal area, faintly yellowish. Basicosta light yellowish brown. Veins light brown to yellowish; R_4 without appendix; cell R_5 widely open or slightly narrowed.

Abdomen.—Rather shining, yellowish brown, with vague darkening on some tergites; hairs on disc uniformly golden brown; marginal hairs inconspicuous. Venter pale greyish yellow, with vague darkening on some sternites, and cream hairs.

Male

Resembles ♀, but beard and pleural hairs darker, and marginal pale hairs on scutum more restricted to the posterior part. Eyes with upper facets markedly enlarged, as in *testacea.* Hairs on parafacials and face yellowish brown, fairly long and dense. Palpi short; hairs on 2nd segment bright brown, not mixed with black.

Distribution.—QUEENSLAND: Mooloolah, Wild; Mt. Tamborine, Davidson; Binna Burra, Dec., M. & M. A ♂ from Mackay seems to belong here, but is more robust than usual, and has incipient median triangles of pale hairs on the abdominal tergites. NEW SOUTH WALES: Dorrigo, Jan., Wright; Meldrum, Dec., Mar., Raven; Deervale, Jan., Burns; Barwick R., near Ebor, on *Leptospermum*, Jan., M. & M.; Comboyne, Dec., Pfeiffer; Kendall; Barrington Tops (Carey's Peak), on *Leptospermum*, Feb., S.U. Zool. Exp.; Kundibakh, Dennes; Eccleston, Feb., Mar.; Gosford, Gallard; Mt. Wilson, Feb., Carter, Day; Govett's Ck., Jan., McMillan; Blackheath, Feb., I.M.M., Nicholson; Blue Mts.; Megalong, Taylor; National Park, Feb., Wirth; Nattai R., Jan., Feb., Reilly; Illawarra, Dec.; Austinmer, Feb.; Bulli Pass, Feb., Mar., Day, G. A. Waterhouse; Cordeaux R., Feb., Mar., Froggatt, McNamara; Colo Vale, Feb., Mar., Lewis, MacLean; Mt. Keira, Walsh; Robertson, Feb.; Nowra, Jan., Deuquet; Tabourie, Feb., Hill; Clyde Mt., Jan., M.J.M.; Durras, Jan., Hill; Moruya, Feb., Froggatt; Narooma, Feb.; Merimbula, Feb., Wilson. VICTORIA: Warburton; no locality (Brit. Mus.).

V. Subgenus PSEUDOSCIONE Lutz, Araujo, & Fonseca

Clanis Walker, 1850, p. 9, nec Hübner, 1816 (Lepidoptera). Type species *Pangonia contigua* Walker, 1848 (= *Pangonia lasiophthalma* Macquart, 1834), Australia, by designation of Coquillett 1910, p. 524.

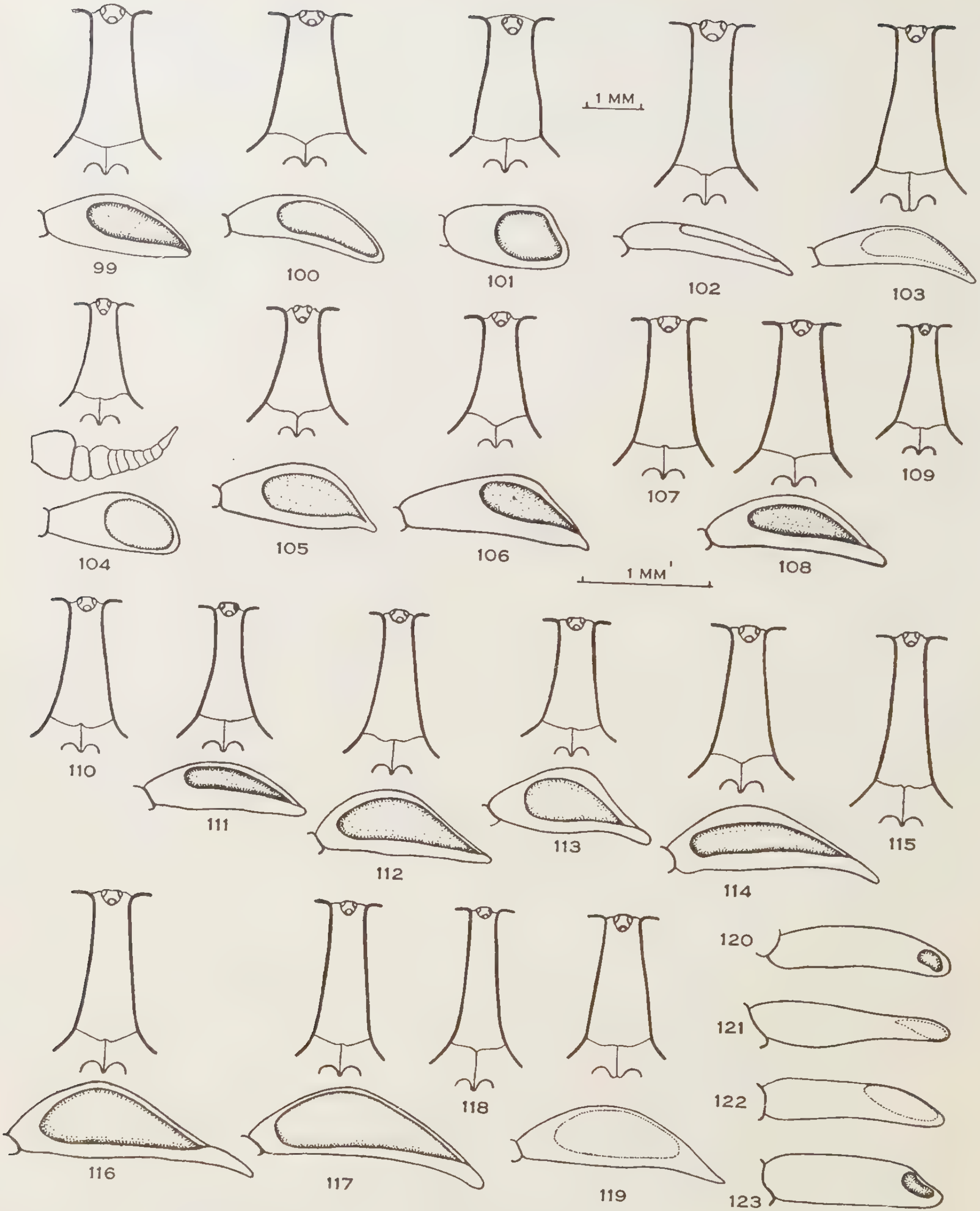
Pseudoscione Lutz, Araujo, and Fonseca, 1918, p. 167; Mackerras 1955*a*, p. 493. Type species *Diatomineura longipennis* Ricardo, 1902, Brazil, by designation of Fairchild 1950, p. 124.

Copidapha Enderlein, 1922, p. 337, 1925, p. 270. Monotypic for *Copidapha bifasciata* Enderlein, 1925 (= *Pangonia roei* Macleay, 1826), Australia. Synonymy by Ferguson 1926*a*, p. 303.

Scaptiella Enderlein, 1923, p. 544. Monotypic for *Pangonia aperta* Loew, 1859, "Lusitania", erroneous (= *Pangonia subappendiculata* Macquart, 1850, Australia).

Astypia Enderlein, 1925, p. 297. Type species *Pangonia jacksonii* Enderlein, 1925, nec Macquart, 1838 (= *Scaptia* (*Pseudoscione*) *calabyi*, sp. nov.), Western Australia, by original designation.

Lilaea Enderlein, 1922, p. 341, 1925, p. 297, nec Walker, 1850, by wrong selection of *Pangonia roei* Enderlein, 1922, nec Macleay, 1826 (= *concolor* Walker, 1850), Australia, as type species. Error corrected by Ferguson 1926*a*, pp. 294, 304.



Figs. 99–123.—Subgenus *Pseudoscione*, females, except last four. 99, *clavata* (Macq.); 100, *gemina* (Walk.); 101, *orientalis*, sp. nov.; 102, *vicina* (Tayl.); 103, *subappendiculata* (Macq.); 104, *regis-georgii* (Tayl.); 105, *neotricolor* (Tayl.); 106, *guttipennis guttipennis* (Ferg.); 107, *testaceomaculata* (Macq.); 108, *maculiventris* (Westw.); 109, *auripleura* (Tayl.); 110, *georgii* (Tayl.); 111, *calabyi*, sp. nov.; 112, *xanthopilis* (Ferg.); 113, *rufonigra* (Ferg.); 114, *subcontigua* (Ferg.); 115, *lasiophthalma* (Macq.); 116, *quadrimacula* (Walk.); 117, *concolor* (Walk.); 118, *aureohirta* (Ric.); 119, *roei* (Macl.); 120, *orientalis*, ♂; 121, *vicina*, ♂; 122, *subappendiculata*, ♂; 123, *maculiventris*, ♂—this is the usual form of ♂ palp in the subgenus.

Female

Mostly medium-sized to rather large (range 9–16 mm), plump species, with relatively long legs. Frons clearly diverging. Face moderately projecting. Proboscis long and slender, from one and a half times to twice the head height, with relatively small, firm labella. Palpi less than half the length of the shaft; usually thick, pointed, and with a well-defined lateral bare area or concavity (Figs. 104–119); occasionally truncate or slender (Figs. 101–103). Wings never marbled, usually with at least a darker cloud across apices of basal cells; cell R_5 often narrowed or closed; cell M_3 always open; vein R_4 usually without appendix. Eighth sternite with gonopophyses usually triangular and approximated apically; cerci often truncate apically; lateral arms of furca not fused with 9th tergite.

Male

Palpi sometimes slightly longer than in ♀, stout, cylindrical, exceptionally tapering to tip, with a small, subapical, dorsolateral bare concavity (Figs. 120–123). Style of hypopygium finger-like, rounded at tip (Figs. 39–41).

There are three aberrant species. The female of *S. roei* has bare eyes, but they are hairy in the male (Ferguson 1926*a*), and it is a normal member of the *concolor* subgroup in other respects. The other two are *S. anomala*, which has already been discussed, and *S. ianthina*, which has a nearly parallel frons and unusual palpi. Both are treated as "ungrouped" at the end of the descriptions.

Groups and Subgroups

The subgenus can be divided conveniently into three groups of species, and the *maculiventris* group into two subgroups.

The clavata *Group*.—Sixth and 7th segments of abdomen longer than wide; terminal segments cylindrical; 8th sternite of unusual shape (Figs. 124–126); the cylindrical appearance can usually be seen in undissected specimens. Large, dark species, with grey wings and very short palpi. The modified "ovipositor" suggests a specialized breeding habit, possibly in sand, like some species of *Dasybasis*. South-eastern and Western Australia. Includes: *clavata*, *orientalis*, *gemina*.

The vicina *Group*.—A large species, distinguished by an unusual degree of sexual dimorphism. The female has very slender palpi, with a narrow bare concavity (Fig. 102); slightly flavid wings, without darker markings; and shining brown abdomen, with fringes of golden hairs on the tergites. The male is smaller, much darker, with a median black vitta on the abdomen, and long, narrow genitalia (Fig. 40). South-eastern Australia. Includes: *vicina*.

The maculiventris *Group*.—Mostly brown species; with dorsoventrally compressed terminal abdominal segments in the female, and no unusual degree of sexual dimorphism; palpi of females usually thick, pointed, and bare or excavated laterally; wings usually with a brown cloud across apices of basal cells, or a definite pattern.

> *The* maculiventris *Subgroup*.—Proboscis usually about twice the head height; palpi short (Plate 2, Figs. 14–17), usually deeply excavated laterally; scutum faintly or distinctly vittate; wings usually with a single brown cloud

across apices of basal cells (Plate 1, Fig. 6); abdomen with a pattern of pigment and hair tufts. There is considerable variation, from the small, clear-winged *regis-georgii*, and the large, almost clear-winged *subappendiculata*, to the ornate *neotricolor* (Plate 4, Fig. 33). *S. subcontigua* has unusually long palpi (Plate 2, Fig. 18) and strongly marked wings (Plate 4, Fig. 34); it is intermediate between this group and the next, and is therefore included twice in the key to the species. Eastern Australia, from south Queensland to Victoria; South Australia; Western Australia. Includes: *subappendiculata, regis-georgii, neotricolor, testaceomaculata, guttipennis, maculiventris, auripleura, georgii, bicolorata, calabyi, xanthopilis, rufonigra, subcontigua.*

The concolor *Subgroup.*—Proboscis about one and a half times head height; palpi relatively large, usually more than one-third the length of the shaft, with the bare area flat or slightly concave (Plate 2, Fig. 19); scutum concolorous, without vittae; wings with two dark bands (Plate 1, Fig. 7; Plate 4, Fig. 35); abdomen usually shining, and without definite pattern. Limited to the eastern littoral and mountains, from north Queensland to Victoria. Includes: *lasiophthalma, quadrimacula, concolor, neoconcolor, aureohirta, roei.*

KEY TO AUSTRALIAN SPECIES OF THE SUBGENUS PSEUDOSCIONE

Females

1. Proboscis short and thick (Fig. 148); palpi longer than half the shaft, slender; a small (9–11 mm), dark species, with fringes of creamy to golden hairs at apices of abdominal tergites. South-eastern Australia .... *anomala*, sp. nov.
Proboscis at least one and a half times as long as height of head, more slender; palpi shorter than half the shaft; larger or paler species 2

2. Terminal segments of abdomen cylindrical (sometimes not apparent, if retracted); large (13–15 mm), dark species, with black, grey-vittate scutum; wings grey, often with darker markings on transverse veins; palpi very short 3
Terminal segments of abdomen dorsoventrally compressed; not such dark species; palpi usually longer and more tapering 5

3. Wings uniformly grey; abdomen black, with median patches of white hair on tergites, and dense white hairs on lateral margins .... *clavata* (Macq.)
Wings less uniformly grey, usually with narrow darker markings at apices of basal cells, fork of R_{4+5} and apex of discal cell; abdomen usually predominantly brown, or with apical fringes of pale hairs on tergites 4

4. Palpi short, blunt (Fig. 101); genitalia as in Figure 125. Eastern Australia .... *orientalis*, sp. nov.
Palpi narrower, tapering (Fig. 100); genitalia as in Figure 126. Western Australia.... .... *gemina* (Walk.)

5. Palpi slender, with flattened bare area (Figs. 102–103); wings without definite brown clouds or pattern; large (13–16 mm), unusual species 6
Palpi stouter, either large (Figs. 116–119), or excavated laterally (Figs. 104–112); wings usually with brown clouds or pattern; more normal species 8

6. A dark brown, almost blackish species; with greyish wings; an apical band of greyish cream hairs on 2nd abdominal tergite, and median and lateral whitish triangles on all tergites. Tasmania .... *ianthina* (White)
Brighter brown species; wings with yellowish tint; abdomen with golden lateral hairs. Eastern mainland 7

7. Palpi very slender (Fig. 102); scutum with well-defined, yellowish brown vittae .... *vicina* (Tayl.)
 Palpi not so slender (Fig. 103); scutum concolorous blackish grey .... *subappendiculata* (Macq.)
8. First antennal segment swollen, 3rd distinctly narrower than 1st (Fig. 104); palpi swollen; a small (9–12 mm), brown, tomentose species with clear or faintly stained wings. Western Australia .... *regis-georgii* (Tayl.)
 First antennal segment little, if at all, wider than 3rd; palpi less swollen 9
9. Palpi distinctly swollen (Fig. 105); wings darkened anteriorly, with a clear spot at apex of *sc*, a broad dark band at apices of basal cells, and conspicuous dark spots at fork of R_{4+5} and apex of discal cell (Plate 4, Fig. 33); a medium-sized (11–12 mm), brown tomentose species, with well-defined, grey scutal vittae. Western Australia .... *neotricolor* (Tayl.)
 Palpi not so swollen; wing markings not as above; scutal vittae usually not so prominent 10
10. Wings with a darker cloud (sometimes faint or narrow) at apices of basal cells, with or without additional faint spots or markings, and sometimes with the area beyond the discal cell grey (Plate 1, Fig. 6; Plate 4, Fig. 34); palpi usually less than one-third the length of the shaft of the proboscis; scutum usually perceptibly vittate; abdomen generally with a pattern of black pigment and pale hairs 11
 Wings with 2 dark bands, one at apices of basal cells, the other (occasionally rather vague) extending to apex of discal cell, beyond which the wing is often distinctly grey (Plate 1, Fig. 7; Plate 4, Fig. 35); palpi more than one-third the length of the shaft of the proboscis; scutum without evident paler vittae or dorsocentral sutural spots; abdominal markings indefinite 21
11. Wings somewhat yellowish anteriorly, with faint or evanescent band at apices of basal cells; bright brown species, with rather vague abdominal pattern; beard and pleural hairs bright yellow 12
 Wings more greyish, with better defined darker markings; darker species, with a more definite abdominal pattern; beard and pleural hairs usually cream to whitish 13
12. Palpi relatively broad (Fig. 112); a robust (12–15 mm) species; scutum blackish grey, with a fringe of fawn; anterior half of abdomen red-brown with a median black vitta, posterior half all black, hairs creamy gold. Eastern Australia .... *xanthopilis* (Ferg.)
 Palpi relatively narrow (Fig. 111); a smaller (12–13 mm) species; scutum rather densely covered with golden hairs; abdomen light brown, somewhat darker apically, with a median black spot on 2nd tergite, and bright golden hairs. Western Australia .... *calabyi*, sp. nov.
13. Pale scutal vittae relatively well defined; palpi dark brown or greyish; femora entirely black or grey 14
 At most indications of pale dorsocentral lines on scutum; palpi reddish brown; femora at least partly yellowish or reddish brown 15
14. Palpi as in *maculiventris* (Fig. 108); wings without darker markings at fork of R_{4+5} and apex of discal cell; a robust species; 8th sternite as in Figure 131. New South Wales, Victoria .... *testaceomaculata* (Macq.)
 Palpi often rather club-shaped (Fig. 106); wings with distinct darker spots at fork of R_{4+5} and apex of discal cell; a more slender species; 8th sternite as in Figures 132, 133. South and Western Australia .... *guttipennis* (Ferg.)
15. Ground colour of basal abdominal tergites dull, yellowish brown, occasionally entirely dark 16
 Ground colour of basal abdominal tergites shining, rich red-brown 19
16. Femora entirely yellowish to reddish brown, occasionally with a black streak basally; large or small species 17
 Femora black or grey on basal fourth or more; relatively small species (10–12 mm) 18

17. A large species (14–15 mm); cloud at apices of basal cells diffuse; hairs on apical edges of abdominal tergites golden. Eastern Australia .... *maculiventris* (Westw.)
A small species (9–12 mm); cloud at apices of basal cells dark, distinct; hairs on apical edges of abdominal tergites cream to yellowish cream. Western Australia.. *bicolorata* (Tayl.)

18. Upper zone of pleural hairs yellow; lateral and segmental abdominal hairs bright golden; 8th sternite as in Figure 135. Eastern Australia .... *auripleura* (Tayl.)
Pleural and lateral abdominal hairs cream, sometimes tinged with pale yellow; segmental abdominal hairs usually dark, except near median line; 8th sternite as in Figure 136. Western Australia .... *georgii* (Tayl.) var.

19. Proboscis more than twice the height of the head; palpi as in *maculiventris*; femora black on basal third only. Western Australia .... *georgii* (Tayl.)
Proboscis about one and a half times the height of the head; palpi and femora otherwise. Eastern Australia 20

20. A smaller (12–13 mm) species, with shorter, wider palpi (Fig. 113), and wider, black abdominal vitta; femora entirely red-brown .... *rufonigra* (Ferg.)
A larger (14–16 mm) species, with longer, narrower palpi (Fig. 114), and narrow, black abdominal vitta; femora predominantly black .... *subcontigua* (Ferg.) pt.

21. Marginal dense hairs on abdominal tergites all golden; scutum and abdomen concolorous, rather shining 22
Marginal dense hairs on abdomen mostly pale on 1st and 2nd tergites, mostly black on 3rd and 4th, and with a rather conspicuous, posterolateral white tuft on 5th or 6th 24

22. Scutum and abdomen deep brown; beard and thoracic hairs golden; legs deep brown to black; a large species (14–15 mm); eyes bare. North Queensland .... *roei* (Macl.)
Scutum not so dark; abdomen yellowish brown, often darker apically; beard and thoracic hairs cream; legs yellowish brown; eyes hairy 23

23. Smaller (12–13 mm); scutum violet-brown; abdomen and legs darkened on apical segments; beard and pleural hairs creamy yellow. North Queensland ..*neoconcolor*, sp nov.
Larger (13–15 mm); scutum, abdomen, and legs almost concolorous dull brown; beard and pleural hairs creamy white. South Queensland, New South Wales ..*concolor* (Walk.)

24. First two abdominal tergites yellowish brown, remainder dark brown to black, contrasting; beard, thoracic hairs, and anterior marginal abdominal hairs bright creamy yellow to golden; a moderately large species (13–14 mm) .... *aureohirta* (Ric.)
Abdomen reddish brown to black; beard and pleural hairs paler creamy yellow; anterior marginal abdominal hairs cream to white; more robust species (14–15 mm) 25

25. Scutum dark reddish to deep brown; wing as in Plate 4, Figure 35; abdomen shining, dark reddish brown to black, without median pale hairs or black vitta .... *quadrimacula* (Walk.)
Scutum blackish grey; wing as in Plate 1, Figure 7; abdomen not so shining, black, more or less marked with brown anteriorly, and with median, apical, rather obscure patches of whitish hairs on 3rd and subsequent tergites .... *lasiophthalma* (Macq.)
Scutum blackish brown; wing as in Plate 4, Figure 34; abdomen shining, red-brown, with a median, narrow, sometimes incomplete, black vitta...... *sucbontigua* (Ferg.) pt.

Notes on the Key

(1) Specimens of *xanthopilis* (caption 12) with the dark cloud on the wing evanescent may be separated from *subappendiculata* (caption 7) by the palpi and abdominal markings. Also, aberrant specimens of *lasiophthalma* (caption 25) with the wing pattern evanescent may be difficult to distinguish from *xanthopilis*.

(2) In Western Australia, *bicolorata* (caption 17) is to be distinguished from *calabyi* (caption 12) by the colour of the pleural and abdominal hairs, and darker cloud at apices of the basal cells.

(3) An uncommon variant of *maculiventris* has the ground colour of the abdomen entirely dark brown, and the hairs duller and paler than in the typical form, but is otherwise indistinguishable.

The clavata *Group*

SCAPTIA (PSEUDOSCIONE) CLAVATA (Macquart)

**Pangonia clavata* Macquart, 1838, p. 101. Type ♀ (not ♂, as stated in description), from Australia, in the Paris Museum.

Diatomineura clavata (Macquart). Ricardo 1900*a*, p. 113, 1915*b*, p. 28; Ferguson 1916, p. 205, 1920, p. 131; Ferguson and Henry 1920, p. 838.

Erephopsis clavata (Macquart). Surcouf 1921, p. 119.

Scaptia clavata (Macquart). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 296.

Material examined.—41 ♀♀.

A robust, black species; with blackish antennae and palpi; faint grey dorsocentral lines on scutum; blackish legs; grey, unspotted wings; and small, median, apical white patches and dense white and black marginal hairs on abdominal tergites. Length 12–15 mm.

Female (Figs. 99, 124)

Head.—Eyes with dark brown hairs, lighter below. Frons variably dark brown and grey, paler near eye margins, and with dense, brownish black hairs. Subcallus brown; parafacials and face grey, variably suffused with brown, and with long, dense, mixed dark brown and white hairs. *Antennae*: 1st and 2nd segments dark greyish brown, with long, black hairs; 3rd blackish brown. Palpi very dark grey; 1st segment with white and black hairs; 2nd with short, black hairs. Beard dense, greyish cream, some hairs brownish apically, giving the beard a somewhat dirty appearance.

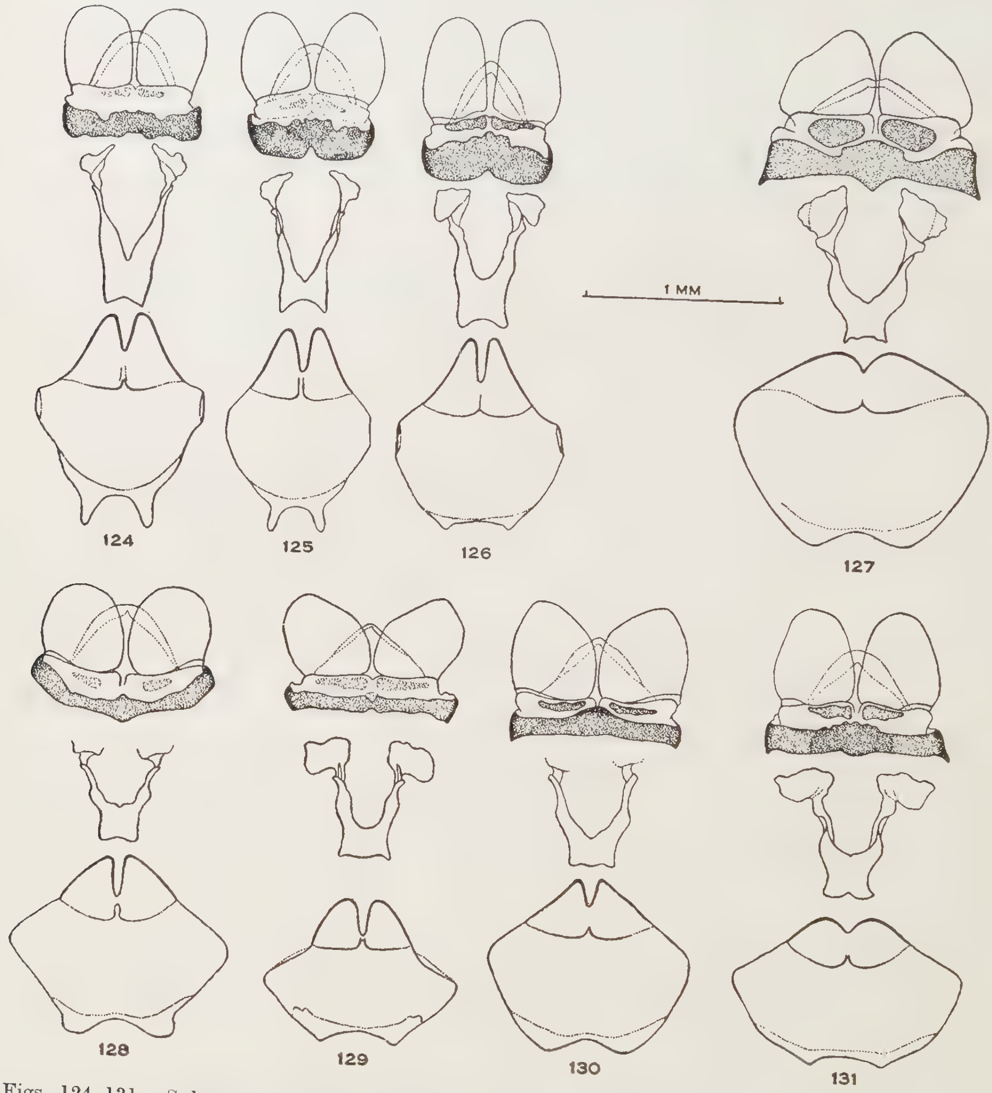
Thorax.—Scutum and scutellum dark brown, with moderately well-defined greyish dorsocentral lines, which become wider and more diffuse behind the suture, and grey lateral areas; hairs on disc black; pronotal tuft white, conspicuous; notopleural hairs black; supra-alar tuft mixed black and white; postalar and marginal scutellar hairs ashy white. Pleura grey; hairs dense, mainly creamy white, but with some admixture of black and with some brown tips, giving the same rather dirty appearance as the beard.

Legs.—Brownish black, fore and mid tibiae dark brown; hairs black, except for some yellow-brown apically on mid and hind femora and ventrally on fore tibiae.

Wings.—Cell at base and costal cell brown, remainder uniformly grey, occasionally a trace of darkening at the apices of the basal cells. Veins dark brown; R_4 angulate, and with a rudimentary appendix; cell R_5 markedly narrowed.

Abdomen.—Black, apices of tergites greyish; hairs on disc black, except for small, median, apical white patches on 2nd to 5th tergites; marginal hairs dense, creamy white on 1st and 2nd tergites, and thereafter in alternating black and creamy white patches. Venter greyish black, with black hairs, except for white ones laterally and basally on 1st and 2nd sternites. Terminal segments tubular; 8th sternite narrow, with elongate gonopophyses; furca long and narrow; 9th tergite not wider than normal; cerci about as long as wide.

Distribution.—NEW SOUTH WALES: Kendall; Tabourie, Mar., Hill; Durras, Feb., Hill; Moruya, Feb., Froggatt; Batlow, Mar., Campbell; Wolseley Park, Jan., Feb., Edwards; Tumbarumba, Mar., Moffitt. VICTORIA: Glen Wills, Feb., Wilson; Lyonville, in forest, Feb., Dobrotworsky; Trentham, Feb., Dobrotworsky; Mt. Disappointment, Feb., Dobrotworsky; Gisborne, Feb., Mar., Lyell; Toolangi, Feb., Henry; Grace Burn, Maroondah, in forest, Mar., Dobrotworsky; Healesville, Feb., Dixon; Yarra Glen, Feb., McIntosh; Warburton, Mar., Burns, Wilson; Powelltown (Little Ada Ck.), Feb., Dobrotworsky; Sherbrook, Feb., Dobrotworsky; Jindivick, Feb., Wilson.



Figs. 124–131.—Subgenus *Pseudoscione*, female genitalia. 124, *clavata* (Macq.); 125, *orientalis*, sp. nov.; 126, *gemina* (Walk.); 127, *vicina* (Tayl.); 128, *subappendiculata* (Macq.); 129, *regis-georgii* (Tayl.); 130, *neotricolor* (Tayl.); 131, *testaceomaculata* (Macq.).

SCAPTIA (PSEUDOSCIONE) ORIENTALIS, sp. nov.

Types.—Holotype ♀, from Jervis Bay, N.S.W., 4.ix.1948, E. F. Riek, in the Division of Entomology Museum, C.S.I.R.O.; allotype ♂, from Nowa Nowa, Vic., 29.ii.1952, F. Erasmus Wilson, in Mr. Wilson's Collection.

Material examined.—2 ♂♂, 65 ♀♀.

A robust, dark species; with dark brown antennae and palpi; well-defined scutal vittae; brown legs; grey wings, with small, darker patches at apices of basal cells, fork of R_{4+5} and apex of discal cell; brown abdomen, with median, blackish patches on basal segments and broad, black bands on apical segments. Distinguished from other members of the group by the very short, rounded palpi (Fig. 101). Length 12–15 mm.

Female (Figs. 101, 125; Plate 2, Fig. 12)

Head.—Eyes with dark brown hairs, somewhat lighter ventrolaterally. Frons brown, variably greyish above and below, with long and dense black hairs. Subcallus brown; parafacials and face brown, with some grey reflections, and with long black hairs variably mixed with greyish white. *Antennae*: 1st segment blackish brown, with some greyish tomentose overlay, and with long, black hairs; 2nd dark brown, with long black hairs; 3rd dark to blackish brown. *Palpi*: 1st segment blackish grey, with black and white hairs; 2nd short and blunt (Fig. 101), dark brown, with black hairs surrounding the wide, rather shallow bare area. Beard creamy white, tinged with brown below eyes.

Thorax.—Scutum brown, with grey vittae; a narrow dark brown median vitta, brown of the broad submedian area not as dark as the sublateral areas; dorsocentral lines clearly defined, grey; suture lighter brown; the lateral areas grey, with a brown spot above wing root. Hairs on disc black erect and rather scattered white recumbent; pronotal tuft greyish white; notopleural hairs mainly black; supra- and postalar tufts with mixed black and white hairs. Scutellum brown, with grey hindmargin, and with black hairs on disc and long greyish white ones marginally. Pleura grey; propleural hairs very dense, greyish white tinged a little with brown; remaining dense hairs greyish white, with a blackish patch below wing root and squamal tuft brown.

Legs.—Brown, becoming darker apically on tarsi, with predominantly black hairs.

Wings.—Grey, costal cell variably brownish, and small brown patches at apices of basal cells, along basal section of Cu_1, apex of discal cell and fork of R_{4+5}; these darker markings are narrow and not conspicuous. Veins brown; R_4 angulate; cell R_5 usually closed, petiolate, occasionally narrowly open.

Abdomen.—Basal tergites rich brown, lighter greyish brown apical bands on all tergites, a large irregular black median patch on 1st, a narrower black patch almost forming a vitta on 2nd, a similar one on 3rd, but merging into indefinite blackish markings more laterally, 4th and subsequent tergites black. Hairs on disc black, with small median apical patches of white hairs on 2nd and subsequent tergites, expanding distally until they form an indefinite apical fringe on the 5th; lateral fringe greyish white, with a patch of black hairs at the basal corners of the

2nd or 3rd to 5th tergites. Venter light brown, darker distally, and with paler apices to sternites; hairs mixed creamy gold and black. Terminal segments tubular; 8th sternite and cerci longer and narrower, 9th tergite wider than in *clavata* (Fig. 125).

Some Victorian females are darker, with entirely dark hairs on parafacials, face, and palpi, and more extensive black banding on abdominal tergites. They agree in other respects, including genitalia.

Male (Fig. 120)

Similar to ♀, but antennae and tibiae not so dark; upper facets of eyes not enlarged; palpi thick, cylindrical, greyish brown with black hairs; and cell R_5 only moderately narrowed. To be distinguished from ♂ *testaceomaculata* by entirely dark 3rd antennal segment, brown (not black, grey-dusted) femora, and darker greyish wings.

Distribution.—NEW SOUTH WALES: Myall Lakes, Sept., I.M.M., Nicholson; Anna Bay, Aug., McMillan; Sydney (Como), Nov., McCulloch; Mt. Kembla; Carrington Falls, Oct., Chadwick; Jervis Bay, Sept., Campbell, Norris, Paramonov, Riek; Ulladulla, Sept., Riek; Burrill Lake, Sept., Riek; Tabourie, Sept., Hill; Merimbula, Sept., Norris. VICTORIA: Nowa Nowa, Feb., Wilson; Emerald, under bark on cold day, Sept., Evans; Pakenham, Sept.; Morwell, Sept., Douglas; Lang Lang, Oct., Wilson; Nyora, Searle; Stony Ck., S. Gippsland, Oct., Willings; Wilson's Promontory, Sept., Douglas.

SCAPTIA (PSEUDOSCIONE) GEMINA (Walker)

**Pangonia gemina* Walker, 1848, p. 138. Type ♀ from Perth, in the British Museum (Natural History).

Erephopsis gemina (Walker). Ricardo 1900*a*, pp. 112, 117, 1915*b*, p. 24; Taylor 1918, p. 56; Ferguson 1921*a*, p. 366; Surcouf 1921, p. 119.

Lilaea gemina (Walker). Enderlein 1925, p. 297.

Scaptia gemina (Walker). Ferguson 1926*a*, p. 297.

Diatomineura testaceomaculata Ricardo, 1915*b*, p. 24, nec Macquart, 1850. Miss Ricardo thought that *testaceomaculata* Macquart, then known only from the ♂, was a synonym of *gemina*, but it proved to be a different species from eastern Australia.

**Erephopsis doddi* Ricardo, 1917, p. 211; Taylor 1918, p. 56; Surcouf 1921, p. 119; Ferguson 1921*a*, p. 366 (syn. of *gemina* Walker). Type ♀, from Warren R., W.A., in the South Australian Museum.

Lilaea doddi (Ricardo). Enderlein 1925, p. 297.

Erephopsis lasiophthalma Taylor, 1919, p. 42, nec Macquart, 1834. The specimen is in the Froggatt Collection in the Division of Entomology Museum, C.S.I.R.O.

Material examined.—8 ♂♂, 54 ♀♀.

A robust, dark species, very similar to *orientalis*, but distinguished by the characters given below. Length 12–15 mm.

Female (Figs. 100, 126)

Antennae with basal segments more greyish, and 3rd more blackish; palpi (Fig. 100) longer, narrower, tapering, and with almost flat bare area. Ground colour of scutum more blackish, and pale thoracic hairs more greyish white. Femora deep to blackish brown. Wing veins dark brown; cell R_5 nearly always narrowly open, occasionally closed at margin. Abdomen generally darker; marginal hairs almost entirely white; 8th sternite and furca shorter and wider.

To be distinguished from *guttipennis* by darker general colour, darker antennae, differently shaped palpi, greyish white rather than cream or yellowish pale thoracic and abdominal hairs, more uniformly greyish wings, and different genitalia.

Male (Fig. 39)

Similar to ♀, but scutal vittae obscured. Hairs on parafacials and face more uniformly dark, palpi more tapering, more extensive dark hairs on upper mesopleural convexity, and tibiae darker than in ♂ of *orientalis*.

Distribution.—WESTERN AUSTRALIA: "Cranmore Park", near Moora, Sept., Tillyard; Hovea, Sept., Norris; Glen Forrest, Sept., Ferguson; Mundaring, Oct.; Darlington, Sept., Nov., Apr., Calaby, Clark, K. G.; Statham's, Oct., Giles; Perth (Swan R.), Clark; Forrestdale, Sept., Calaby; Kelmscott, Sept., Oct., Common, Giles; 13 miles SE. of Armadale, Sept., Calaby; Yarloop, Nov., Burns, Wilson; Bunbury, Nov., Jan., Burns, Mack; Dumbleyung, sand plain, Sept., Kipps; south-west district, Sept., Kipps; near Collie, Nov., McIntosh and Calaby; Busselton; Jingalup, Oct., Calaby; Stirling Range, Bluff Knoll, 3600 ft, Oct., Common; Pemberton, Oct., Main; Warren R., W. D. Dodd; Nornalup, Oct., Common, Main, Wallace; Albany, Oct., Common, Norris, Wallace.

The vicina *Group*

SCAPTIA (PSEUDOSCIONE) VICINA (Taylor)

**Erephopsis vicina* Taylor, 1918. p. 57; Ferguson 1920, p. 131. Type ♂, from Wentworth Falls, N.S.W., in the Australian Museum, Sydney.

Scaptia vicina (Taylor). Ferguson 1926*a*, p. 297, fig. 7; English 1955, p. 219 (larva and pupa).

Scaptia (*Pseudoscione*) *vicina* (Taylor). Mackerras 1955*a*, fig. 28*H*.

Material examined.—12 ♂♂, 13 ♀♀.

A large, broad, dimorphic, brown species, with slender, pointed palpi, well-defined scutal lines, clear wings, and rich golden upper pleural and marginal abdominal hairs. Length 14–17 mm, the males smaller and darker than the females.

Female (Figs. 102, 127; Plate 2, Fig. 13)

Head.—Eyes with short brown hairs on upper three-fourths, cream below. Frons brown in centre, pale fawn laterally and below, with short, dark brown hairs. Subcallus brown centrally, pale creamy grey laterally; parafacials and face pale fawn-grey; parafacials with white hairs, face with black and white hairs. *Antennae*: 1st segment swollen, pale greyish fawn, with black and golden brown hairs; 2nd small, pale greyish fawn, with more brown-gold hairs; 3rd slender, yellowish brown at base, remainder darker reddish brown. *Palpi*: 1st segment brownish grey, with silky white hairs below; 2nd light brown above, brownish grey below, with the bare area narrow and directed dorsally, and the remainder with short black hairs and some fine silvery ones ventrally. Beard creamy yellow.

Thorax.—Scutum dark brown, with well-defined, greyish brown median and dorsocentral lines, suture, and lateral areas; hairs on disc mixed erect black and more conspicuous recumbent dull golden; notopleural hairs mixed black and dark golden, giving the appearance of a distinct brown stripe along anterior part of lateral margin; supra- and postalar tufts rich golden. Scutellum bright brown, with fine, dull golden hairs. Pleura pale grey, with rich golden propleural, upper mesopleural, and squamal tufts; remaining hairs silvery.

Legs.—Bright yellowish brown, with silvery hairs on the femora, and bright to reddish golden ones on the other segments.

Wings.—Almost clear, somewhat yellowish anteriorly, and without definite darker markings, although there is an indication of a faint cloud at the apex of first basal cell. Veins bright to yellowish brown; R_4 without appendix; cell R_5 closed, petiolate.

Abdomen.—Shining bright brown, paler towards apical edges of tergites; disc with some dark hairs anteriorly, rich golden ones elsewhere, especially along posterior margins of the tergites, thickening to form a somewhat denser median apical tuft on 1st tergite; lateral hairs dense, conspicuous, rich golden; apical edge of 7th tergite with black hairs, which sometimes predominate and give the abdomen a blackish tip. Venter shining bright brown, with cream hairs, and silvery ones forming a fringe along apices of sternites.

Male (Figs. 40, 121)

Much darker than ♀. Eyes with upper facets not obviously enlarged. Palpi relatively slender, tapering, grey, with bright brown bare area, and mixed silvery and some black hairs. Beard yellow. Scutum and scutellum deep brown, with the grey vittae narrower, and with dark brown to black hairs, except for some creamy gold ones anteriorly and on the shoulders; notopleural hairs, supra-alar tuft, some upper mesopleural hairs, and squamal tuft brownish black. Hind tibiae and tarsi with numerous, preponderantly black hairs dorsally. Abdomen with distinct indications of a median black vitta and predominantly black hairs on disc, but with rich golden marginal hairs, as in ♀. Genitalia (Fig. 40) unusually long and narrow.

Distribution.—QUEENSLAND: Brisbane; Mt. Tamborine, Jan., Kelsall (British Museum). NEW SOUTH WALES: Dorrigo, Feb., Wright; Armidale, Deuquet; Barrington Tops (Carey's Peak), on *Leptospermum*, Feb., S.U. Zool. Exp.; Avalon, Feb., English; Wentworth Falls; Sydney (Roseville, Woolwich), Mar., English, Gallard, Gibbons; Illawarra Coastal Range, Mar.; Bulli Pass, Feb., G. A. Waterhouse; Mt. Kembla, Mar., Chadwick.

The maculiventris *Group*

SCAPTIA (PSEUDOSCIONE) SUBAPPENDICULATA (Macquart)

**Pangonia sub-appendiculata* Macquart, 1850, p. 19. Type ♀, from "Tasmanie" (erroneous), in the Paris Museum.

Diatomineura subappendiculata (Macquart). Ricardo 1900*a*, p. 113; White 1915, p. 21; Surcouf 1921, p. 131; Ferguson and Hill 1922, p. 247.

Scaptia subappendiculata (Macquart). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 297; Lee, Dyce, and O'Gower 1957, p. 371.

**Pangonia aperta* Loew, 1859, p. 32. Type ♀, from "Lusitania" (Portugal), in the Vienna Museum. This species, and Enderlein's "Palaearctic" genus *Scaptiella* based on it, have caused considerable confusion. The type ♀ (not ♂, as listed by most authors) was kindly sent to me by Dr. Beier, and proved to be identical with *subappendiculata* in both external and genitalic characters. It also agreed perfectly with Loew's description. There is no indication how the error in labelling occurred.

Scaptiella aperta (Loew). Enderlein 1923, p. 544; Mackerras 1955*a*, p. 457.

**Diatomineura inflata* Ricardo, 1915*b*, p. 34; Taylor 1918, p. 61; Ferguson 1916, p. 205, 1920, p. 131; Ferguson and Henry 1920, p. 837; Surcouf 1921, p. 130; Ferguson and Hill 1922, p. 247 (syn. of *subappendiculata* Macquart); Hardy 1929, p. 62. Type ♀, from south Queensland, T. L. Bancroft, 1908, in the British Museum (Natural History).

Scaptia inflata (Ricardo). Enderlein 1925, p. 278; Hardy 1940, p. 485.

Material examined.—2 ♂♂, 79 ♀♀.

A robust species; with distinctive palpi (Fig. 103); dark grey scutum; yellowish brown legs; faintly yellowish wings; and bright brown abdomen, with small median apical patches of creamy yellow hair on tergites. Length 13–17 mm, most specimens 15–16 mm. This species links the *vicina* and *maculiventris* groups, but the male is not strikingly different from the female, and its genitalia are normal.

Female (Figs. 103, 128; Plate 2, Fig. 14)

Head.—Eyes bright green in life; with short brown hairs above, creamy white ones below. Frons light yellowish to greyish fawn, with irregular, light brown markings in central area, and short brown hairs. Subcallus pale yellowish cream, brownish yellow above antennae; parafacials light creamy yellow, with fine creamy yellow hairs below; face light creamy yellow, with fine cream hairs and a few dark ones just below antennae, central area bald and more brownish above insertion of proboscis. *Antennae*: 1st and 2nd segments light creamy yellow, with black hairs, and some fine creamy yellow ones below; 3rd bright orange. Palpi light yellowish brown, the bare area a little darker; 1st segment with fine cream hairs below; 2nd with short black hairs. Proboscis shorter than usual in group, about one and a half times head height. Beard creamy yellow.

Thorax.—Scutum and scutellum blackish grey, with a lighter grey tomentose overlay; suture somewhat paler, but at most faint indications of the position of the dorsocentral lines; hairs on disc short, mixed black and yellowish cream; notopleural hairs dull golden mixed with some black ones; supra- and postalar tufts creamy yellow. Pleura pale grey, with bright yellow propleural, upper mesopleural, and hypopleural tufts, the remainder light yellowish cream.

Legs.—Bright yellowish brown, with yellow and black hairs, the black predominating on hind tibiae and tarsi.

Wings.—Almost clear, yellowish on anterior margin, and with a vague trace of darkening at apices of basal cells. Veins bright yellowish brown; R_4 strongly curved, but with at most trace of appendix; cell R_5 moderately narrowed to almost closed.

Abdomen.—Rather shining, bright brown, with a yellowish hue, and only slightly paler on posterior margins of tergites; hairs on disc black, with median apical patches of creamy golden hairs on all tergites; marginal hairs mainly creamy gold, mixed with some black towards bases of tergites. Venter light yellowish laterally on 1st and 2nd sternites, bright brown centrally and over most of subsequent sternites, but with paler hind margins; hairs creamy gold, variably mixed with black on darker areas.

Male (Fig. 122)

Similar to ♀, though showing the usual minor sexual differences. Upper facets of eyes not enlarged; palpi rather *Scaptia*-like, tapering, creamy yellow, with orange apical bare area; cell R_5 widely open.

Distribution.—QUEENSLAND: Mt. Tamborine, Davidson, Froggatt; Canungra, Mar., Davidson, Pritchard (♂, in car). NEW SOUTH WALES: Tarban, Feb., Ferguson; Dorrigo, Feb., Apr., Wright; Meldrum, Mar., Raven; Kew, Jan.; Kendall, Feb., Mar., Tillyard; Clarencetown, Feb.; Toronto, Filmer; Gosford, Gallard; Pt. Clare, Apr.; Wiseman's Ferry, attacking stock, Feb., Farrell; Rabbit I., Hawkesbury R., Mar.; Clareville, Mar., T.D.B.; Sydney (Lane Cove); Glenfield, Apr., Seddon; Nattai R., Feb., E.R.; Cordeaux R., Mar., Whitfield; Colo Vale, biting man, Feb., Mar., Dyce, Lee.

SCAPTIA (PSEUDOSCIONE) REGIS-GEORGII (Taylor)

**Diatomineura regis-georgii* Taylor, 1918, p. 60. Type ♀, from King George Sound, W.A., in the Australian Museum, Sydney.

Scaptia regis-georgii (Taylor). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 297, fig. 6.

Material examined.—15 ♂♂, 27 ♀♀.

A small to medium-sized, brown species, with light yellowish brown legs and unmarked wings; superficially resembles *S.* (*S.*) *jacksonii*, but has long, slender proboscis and quite different palpi. Length 9–12 mm.

Female (Figs. 104, 129; Plate 2, Fig. 15)

Head.—Eyes with long, dark brown hairs on upper third, cream below. Frons greyish fawn, with long, dark brown hairs mixed with some white ones below. Subcallus pale fawn, with greyish reflections; parafacials and face pale fawn, with long, dull creamy hairs. *Antennae*: 1st segment swollen; 1st and 2nd light brown, with cream overlay and black hairs; 3rd bright orange-brown on basal half, somewhat darker on apical 4 annuli. Palpi light yellowish brown; 1st segment with long, silky, dull cream hairs; 2nd considerably swollen (Fig. 104), and with rather strong black hairs basally and around the somewhat darker bare area. Beard dull yellowish cream.

Thorax.—Scutum and scutellum dark olive brown, with mixed erect black and appressed dull golden hairs; notopleural hairs dark brown; supra- and postalar tufts dull yellowish cream and creamy white; marginal scutellar hairs dull yellowish cream. Pleura light grey, with dull cream hairs, propleural and squamal tufts somewhat yellowish.

Legs.—Light brown, somewhat darker on apical segments; hairs on femora mixed black and dull cream, remainder mainly black.

Wings.—Faintly grey, with costal cell somewhat darkened, and either no markings at all, or occasionally a very faint darkening at apex of 1st basal cell. Veins brown to yellowish brown; R_4 angulate, with or without short appendix; cell R_5 markedly narrowed.

Abdomen.—Brown, with somewhat irregular, dark markings on basal three-fourths and light brown bands on apical fourth of the tergites; 1st with broad, irregular, brownish black patch over most of the basal part of the disc; 2nd with a fairly broad, median, blackish vitta; 3rd and subsequent tergites with broad, blackish brown bands; hairs black on the basal parts of the tergites, bright golden to dull creamy gold on the paler apical areas, widening somewhat in the mid-line to form vague median triangles; lateral hairs moderately dense, alternating black and creamy gold, more or less in correspondence with the disc, but with the pale hairs predominating. Venter irregularly pale yellowish grey, with creamy grey apical bands on the sternites, and fine, silky, creamy hairs. Terminal segments wide and flat; 8th sternite (Fig. 129) of unusual shape, and with strongly projecting gonopophyses.

Male

Similar to ♀. Eyes with upper facets not obviously enlarged; 3rd antennal segment slender; palpi bulky, with strong black and yellow-brown hairs on 2nd segment; proboscis even longer and more slender than ♀; pale hairs on body denser and more yellowish.

Distribution.—WESTERN AUSTRALIA: Geraldton, common Feb. to May, Clark; Mundaring; Perth (Subiaco, Wembley, Crawley, Swan R.), Nov., Dec., Clark, Fuller, Newman, Norris, Wilson; Rottnest I., Sept.; Fremantle, Nov., Norris; Palm Beach, Rockingham, Dec., Calaby; Bunbury, Nov., Wilson; Capel, Nov., Clark; Yallingup, R. E. Turner (British Museum); Pt. D'Entrecasteaux, Dec., Norris; Albany, Jan., Norris.

SCAPTIA (PSEUDOSCIONE) NEOTRICOLOR (Taylor)

**Erephopsis neotricolor* Taylor, 1918, p. 55. Type ♀, from King George Sound, W.A., in the Australian Museum, Sydney.

Scaptia neotricolor (Taylor). Ferguson 1926*a*, p. 297.

Material examined.—9 ♂♂, 19 ♀♀.

A small to medium-sized, brown species, with rather swollen palpi, unusually long, slender proboscis, strong scutal vittae, and a distinctive wing pattern. Length 10–12 mm.

Female (Figs. 105. 130; Plate 4, Fig. 33)

Head.—Eyes with dark brown hairs above, whitish below. Frons pale fawn-grey, with indefinite brown patches in middle, and long, dark brown hairs. Subcallus pale grey in centre, light brown with a few creamy hairs laterally; parafacials pale grey, with some brown suffusion and long cream hairs above, a few black ones below; face light brown, with cream overlay, and long black hairs, some shorter creamy ones laterally. *Antennae*: 1st and 2nd segments light brown, with fawn-grey tomentum, and long black hairs; 3rd bright orange-brown, darkening on apical annulus. Palpi light fawn-brown; 1st segment with long, silky, creamy hairs below; 2nd with short black ones around the reddish brown bare area, which is only slightly concave. Beard cream.

Thorax.—Scutum dark brown, with a narrow grey median line in front of suture, prominent grey dorsocentral vittae, which widen and become confluent behind the suture, and greyish lateral areas containing a brown spot above wing root; hairs on disc mixed black erect and recumbent golden brown, and some fine whitish ones on the pale area in front of scutellum; propleural tuft yellowish cream, conspicuous; notopleural hairs black, mixed with some golden brown; supra- and postalar tufts creamy white. Scutellum brown, darker laterally, with black and golden brown hairs on disc, and some creamy white ones on either side adjacent to the postalar tuft. Pleura light fawn-grey, with dense, pale greyish cream hair tufts, and some darker yellowish to black ones on mesopleural convexity.

Legs.—Bright brown, somewhat darker on tarsi; hairs black, except for an admixture of yellowish cream ones on femora.

Wings.—Greyish, with costal cell brown, and distinct dark clouds at apices of basal cells, apex of discal cell, and fork of R_{4+5}; there are whitish patches near apex of 1st basal cell, and below tip of *sc*, made more conspicuous by darker suffusion of the part of the wing apical to them. Veins brown, paler adjacent to the whitish spots; R_4 angulate, with or without short appendix; cell R_5 closed, petiolate.

Abdomen.—Brown, apices of tergites paler, and with wide median blackish brown basal patch on 1st tergite, incomplete median blackish vittae on 2nd and 3rd, spreading out to form rather vague dark bands on subsequent tergites; hairs on disc black, apical fringes golden to cream, and small, variable median white patches on 1st to 5th tergites; marginal hairs cream, with small, variable, black basal patches on 2nd or 3rd to 5th tergites. Venter light brown, with a greyish tint, and apices of sternites paler; hairs cream, except for a few black ones in median zone. Eighth sternite with rather sharply acuminate gonopophyses.

Male

Similar to ♀, but 3rd antennal segment exceptionally slim, proboscis particularly long and slender, the general coloration somewhat darker, and the scutal lines more or less obscured. Eyes with upper facets not obviously enlarged; palpi subcylindrical, with strong black and cream hairs.

Distribution.—WESTERN AUSTRALIA: Eradu, Sept., Ferguson, McIntosh and Calaby; Kojarena, Sept., Ferguson, Nicholson; Geraldton, Sept., Nicholson; Mingenew, Oct., R. E. Turner (British Museum); Darlington, Sept., K.G.; Yallingup, Nov., R. E. Turner (British Museum); Margaret R., Oct., Wallace; Cape Mentelle, Oct., Common; Denmark, Oct., Newman (British Museum); Bornholm, Troughton.

The maculiventris *Complex*

The next seven species form a closely knit series, and some of them may prove difficult to identify accurately, if named specimens are not available for comparison. There is no significant overlap between east and west, so the problem can be simplified by taking the species geographically.

The three eastern species (*testaceomaculata*, *maculiventris*, *auripleura*) can be separated fairly readily, particularly when the genitalic differences (Figs. 131, 134, 135) are taken into account. Only *guttipennis* is known so far from South Australia. The difficulties are in Western Australia, and they are due, partly to superficial resemblances to eastern species, but principally to the variability of *georgii*, coupled with a lack of locally distinctive genitalic features. The small, *bicolorata*-like form of this species is as different from the large, *subcontigua*-like form as *auripleura* from *subcontigua* in the east; but there is every gradation between them, no evident geographical cline, and I have been unable to find any discontinuity on which to divide the population.

Workers in the west may find it convenient to use the following short key to local females, rather than attempt to discriminate between all the species of the complex.

1. Palpi dark grey; femora entirely black, grey dusted 2
   Palpi reddish to yellowish brown; femora at least partly pale 3
2. Beard and upper pleural hairs mostly yellow; apical 4 annuli of antennae blackish brown, sharply contrasting .... *guttipennis occidentalis*
   Beard and upper pleural hairs cream; apical annuli of antennae diffusely darkened .... *guttipennis guttipennis*
3. Ground colour of abdomen shining, rich red-brown; larger forms (14–15 mm); femora black on basal third or more .... *georgii* (typical)
   Ground colour of abdomen duller, more yellowish brown; smaller forms (9–13mm); femora various 4
4. Femora black on basal fourth or more; cloud at apices of basal cells of wing moderately defined .... *georgii* var.
   Femora entirely yellowish to reddish brown (occasionally dark at extreme base); cloud at apices of basal cells weak or strong 5
5. A smaller (9–12 mm), darker species, with evident scutal vittae, dark abdominal pattern, and conspicuous dark cloud at apices of basal cells .... *bicolorata*
   A more robust (11–13 mm), paler species, with scutal and abdominal patterns reduced and obscured by covering of yellow hairs; cloud at apices of basal cells faint or evanescent .... *calabyi*

SCAPTIA (PSEUDOSCIONE) GUTTIPENNIS GUTTIPENNIS (Ferguson)

Osca guttipennis Ferguson, 1924, p. 259. The type ♀ was stated to be in the South Australian Museum, but has not been found. Mr. F. G. Gross, Curator of Insects in the Museum, kindly lent me the original series, from which I selected, as lectotype, a ♀, from Port Lincoln, S.A., A. M. Lea, labelled "*Erephropsis ?maculipennis* Macq." in Miss Ricardo's handwriting, referred to by Ferguson, and agreeing with his description.

Scaptia guttipennis (Ferguson). Ferguson 1926*a*, p. 296.

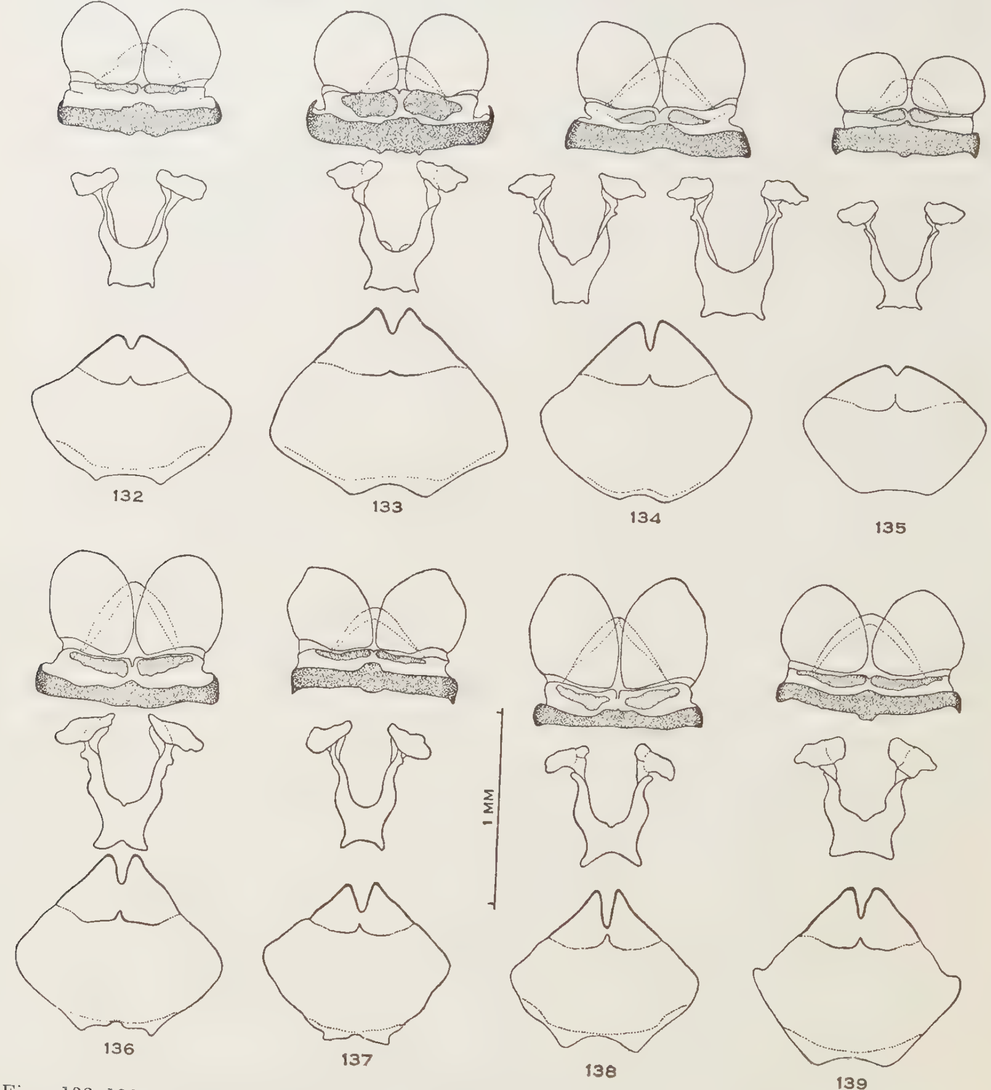
Erephopsis maculipennis Ricardo, 1917, p. 209, nec Macquart, 1850. Miss Ricardo's determination of specimens in the South Australian Museum was accepted by Taylor (1918, p. 56) and Ferguson (1921*a*, p. 366). Later, Ferguson (1924, p. 257) concluded that *maculipennis* Macquart was a synonym of the eastern *lasiophthalma* Macquart, and this view proved to be correct.

Material examined.—17 ♀♀.

A medium-sized, rather drab species; with apical annuli of antennae diffusely darkened; dark grey, usually thickened palpi; moderately well-defined scutal vittae; dull cream beard and pleural hairs; blackish femora, contrasting with brown tibiae; relatively discrete clouds at apices of basal cells, apex of discal cell, and fork of R_{4+5}; strongly banded abdomen; and subtriangular gonopophyses. Length 12–14 mm.

Female (Figs. 106, 132)

Head.—Eyes with dark brown hairs above, whitish below and laterally. Frons grey, variably marked with brown, with dark brown hairs. Subcallus grey above and centrally, fawn-cream below and laterally, without hairs; parafacials grey, with a fawn tint, and long white and a few black hairs; face more grey-brown, with white and black hairs. *Antennae*: 1st and 2nd segments brown, with grey tomentum above, fawn below, and long black hairs, mixed with creamy white below; 3rd dark at extreme base, mostly orange to reddish brown, diffusely darkening on apical 3 or 4 annuli. Palpi dark grey, with brown concavity; hairs mainly short and black on 2nd segment, long and cream below on both segments. Beard cream.



Figs. 132–139.—Subgenus *Pseudoscione*, female genitalia. 132, *guttipennis guttipennis* (Ferg.); 133, *guttipennis occidentalis*, subsp. nov.; 134, *maculiventris* (Westw.), showing two forms of furca; 135, *auripleura* (Tayl.); 136, *georgii* (Tayl.); 137, *bicolorata* (Tayl.); 138, *calabyi*, sp. nov.; 139, *xanthopilis* (Ferg.).

Thorax.—Scutum and scutellum dark brown, with grey median and dorsocentral vittae and lateral areas, the median vitta fading behind suture, and the dorsocentrals becoming diffuse posteriorly; hairs on disc black erect and dull gold recumbent, except for some fine cream ones in front of scutellum; pronotal tuft dull cream; notopleural hairs black, conspicuous; supra- and postalar tufts creamy white; marginal scutellar hairs yellowish cream, inconspicuous. Pleura pale grey, with dense cream to creamy white hairs, and a few black ones on upper mesopleural convexity; squamal tuft bright cream.

Legs.—Femora blackish, with grey tomentose overlay, and yellowish cream and some black hairs; remaining segments bright brown, darkening on tarsi, with black hairs dorsally, golden brown ventrally.

Wings.—Greyish, costal cell light brown, and darker brown clouds across apices of basal cells, apex of discal cell, and fork of R_{4+5}; centres of basal, discal, and some of radial cells clearer, contributing to distinctive appearance of the wing. Veins light brown anteriorly, darker brown posteriorly and distally; R_4 angulate, with short appendix; cell R_5 closed, short-petiolate.

Abdomen.—First and 2nd tergites brown to yellowish brown, with median blackish brown vitta, and light cream apical margin to 2nd; remaining tergites with broad, blackish brown basal bands (sometimes incomplete on 3rd) and narrower, light cream-brown apical bands; hairs predominantly black on darker parts, mixed black and yellowish cream sublaterally on 1st and 2nd tergites, yellowish cream on the apical pale bands, and in small median white tufts on all tergites; lateral hairs cream to creamy white, variably mixed with black at sides of 3rd to 5th tergites. Venter light brown, variably darkened basally across most of sternites, and with brownish cream apical bands on all but 1st; hairs creamy white, except for some black in median zone posteriorly. Terminal segments essentially similar to those of *maculiventris*.

The abdominal pattern is basically normal for the complex, but with the appearance of cross banding strongly accentuated.

Distribution.—SOUTH AUSTRALIA: Cleve, Sept., Bent; Yeelanna; Port Lincoln, Oct., Griffith, Lea, Wilson; Yorketown, Dec., Young. WESTERN AUSTRALIA: Mundaring, Oct.

SCAPTIA (PSEUDOSCIONE) GUTTIPENNIS OCCIDENTALIS, subsp. nov.

Types.—Holotype ♀, from Dryandra, W.A., 14.x.1954, J.H. Calaby, and allotype ♂, from 6 miles N. of Watheroo, W.A., 11.ix.1952, McIntosh and Calaby, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—1 ♂, 13 ♀♀.

More brightly coloured than the typical subspecies, with richer yellow thoracic and abdominal hairs, and further distinguished as noted below. Length 11–14 mm.

It is difficult to decide on the status of this form. On the one hand, the differences in coloration may be due, at least in part, to the fact that the specimens are fresher than any typical *guttipennis* I have seen; while, on the other hand, the occurrence of a specimen of typical *guttipennis* in Western Australia, and the slight differences in the genitalia (Figs. 132, 133; three of each race dissected) raise the suspicion that they may really be separate species. Fresh material from South Australia is needed to settle the question.

Female (Fig. 133)

Head.—Frons and subcallus with a more brownish tint; 3rd antennal segment with basal 4 annuli bright orange to reddish brown, contrasting with the deep to blackish brown apical 4. Beard yellowish, at least adjacent to cheeks, often entirely yellow.

Thorax.—Scutal vittae more obscured by the recumbent brown-gold hairs, which are denser than in typical *guttipennis*, and give the scutum a different tint; supra- and postalar tufts creamy yellow to brown-gold; pleural hairs deep yellowish above, more creamy below and on squamal tuft.

Legs.—Tibiae and tarsi darker, and less contrasting with femora.

Wings.—Dark patches at apex of discal cell and fork of R_{4+5} evanescent; membrane clearer in basal and discal cells only; R_4 strongly curved or angulate, but without appendix.

Abdomen.—Ground colour more extensive and brighter, and apical bands on tergites more yellowish, the general appearance being less strongly fasciate than in typical *guttipennis*; pale apical fringes bright yellow, median tufts small, cream, and marginal hairs creamy yellow; hairs on venter yellowish cream.

Male

Similar to ♀, but scutal vittae more obscure, abdominal pattern stronger, and lateral fringes to 3rd and 4th tergites almost entirely black, contrasting. Upper facets of eyes not obviously enlarged; palpi dark grey, with orange-brown bare area, and strong black hairs below, creamy yellow ones above and basally.

Distribution.—WESTERN AUSTRALIA: 6 miles N. of Watheroo, Sept., McIntosh and Calaby (♂); Wongan Hills, Oct., Norris; 19 miles W. of Brookton, Oct., Calaby; Dryandra, Oct., Calaby.

SCAPTIA (PSEUDOSCIONE) TESTACEOMACULATA (Macquart)

**Pangonia testaceomaculata* Macquart, 1850, p. 21. Type ♂, from Australia, in the British Museum (Natural History).

Diatomineura testaceomaculata (Macquart). Ricardo 1900*a*, p. 113, 1915*b*, p. 24 (considered to be a syn. of *gemina* Walker); Surcouf 1921, p. 131.

Scaptia tectaceomaculata (Macquart). Enderlein 1925, p. 278 (lapsus).

**Pangonia dorsomaculata* Macquart, 1850, p. 21. Type ♂, from "Tasmanie" (erroneous), in the Paris Museum. The type is labelled "*dorsonotata*", and it agrees perfectly with *testaceomaculata*, which has precedence on the page.

Diatomineura dorsomaculata (Macquart). Ricardo 1900*a*, p. 113; White 1915, p. 21; Surcouf 1921, p. 130.

Osca dorsomaculata (Macquart). Ferguson 1924, p. 261; Hardy 1929, p. 62.

Scaptia dorsomaculata (Macquart). Enderlein 1925, p. 278.

Pangonia barbata Walker, 1848, p. 135, nec Linnaeus, 1764. Walker identified a hairy-eyed species, supposedly from Cape of Good Hope, as *barbata*. He was followed by Miss Ricardo (1900*a*, pp. 106, 109, as *Diatomineura*), Austen (1920, p. 139, as *Osca*), and Mackerras (1954, fig. 7*b*, 1955*a*, fig. 28*E*, as *Scaptia*). Further study of Walker's specimens showed that they were conspecific with the Australian *testaceomaculata* (Oldroyd 1957, pp. 453, 455).

Material examined.—5 ♂♂, 13 ♀♀.

A robust species, which appears to be intermediate between *guttipennis* and *maculiventris*, but is distinguished from both by the small, rounded gonopophyses of the 8th sternite. Length 13–15 mm.

Female (Figs. 107, 131)

Distinguished externally from *guttipennis* by more robust build; darker apical 4 annuli of 3rd antennal segment (though not as sharply defined as in *occidentalis*); usually more slender palpi; normally patterned wings, with clouds at apex of discal cell and fork of R_{4+5} evanescent; and vein R_4 usually without appendix.

Distinguished from *maculiventris* by dark terminal annuli of antennae; darker palpi; darker, more strongly vittate scutum; blackish femora; and darker, more strongly banded abdomen.

Male

Similar to ♀, though scutal pattern more obscured by hairs. Distinguished from ♂ of *maculiventris* by duller general coloration; paler, ashy white hairs on lower facets of eye, contrasting more strongly with dark brown hairs on upper facets; better defined scutal vittae; and blackish, grey-dusted femora. Vein R_4 rectangular near base, with trace of appendix; cell R_5 narrowed but not closed at wing margin. Genitalia with 9th tergite distinctly longer than wide; otherwise as in *maculiventris*.

Distribution.—NEW SOUTH WALES: Ashford, Oct., Merry; Tamworth, Nov. AUSTRALIAN CAPITAL TERRITORY: Lee's Spring, Nov., Paramonov, Riek. VICTORIA: Gibraltar Point, Wonnangatta R., Dec., Campbell.

SCAPTIA (PSEUDOSCIONE) MACULIVENTRIS (Westwood)

Pangonia maculiventris Westwood, 1835, p. 449; Ricardo 1900*a*, p. 114; Surcouf 1921, p. 128 (as *Pangonius*). Type, sex not stated, from Australia, stated to be in Westwood's collection, but apparently no longer in existence.

Osca maculiventris (Westwood). Ferguson 1924, p. 258. This was the first time the name was associated with a recognized Australian species.

Scaptia maculiventris (Westwood). Ferguson 1926*a*, p. 296, fig. 5; Mackerras 1954, fig. 7*c*.

Scaptia (*Pseudoscione*) *maculiventris* (Westwood). Mackerras 1955*a*, figs. 2*D*, 28*D*, 28*G*.

Pangonia bicolor Macquart, 1846, p. 24; Walker 1854, p. 143. Type ♀, from Australia, stated to be in the Guérin et Reiche Collection; not found in the Paris Museum.

Erephopsis bicolor (Macquart). Ricardo 1900*a*, p. 112; Surcouf 1921, p. 119; Ferguson 1924, p. 260 (probable syn. of *maculiventris* Westwood; I concur).

Lilaea bicolor (Macquart). Enderlein 1925, p. 297.

Erephopsis lasiophthalma Ricardo, 1917, p. 210 (cited as of Boisduval), nec Macquart, 1834. Miss Ricardo's error was followed by Taylor (1917*b*, p. 517, 1918, p. 56) and Ferguson (1920, p. 131, 1921*a*, p. 366), and corrected by Ferguson (1924, p. 259).

Pangonia jacksonii Ferguson, 1924, p. 258; ?Froggatt 1911, p. 7, fig. 6 (as *Tabanus*); nec Macquart, 1838.

Material examined.—41 ♂♂, 279 ♀♀.

A robust, brown species; with bright brown antennae and palpi; dark brown scutum, with obscure dorsocentral lines; entirely bright brown femora; a brown cloud at apices of basal cells of wing; basal abdominal tergites usually bright to yellowish brown sublaterally, apical fringes of tergites golden, and median tufts cream to white. Length 12–15 mm, most specimens 14–15 mm.

Abundant in highlands of southern New South Wales and Victoria; to be distinguished from the much rarer *testaceomaculata* by the undarkened 3rd antennal segment and femora, brown palpi, differently coloured, less evidently vittate scutum, and golden rather than cream fringes on the abdominal tergites.

Female (Figs. 32, 108, 134; Plate 1, Fig. 6; Plate 2, Fig. 16)

Head.—Eyes with blackish brown hairs on upper half, creamy white below. Frons fawn-grey, irregularly light brown towards mid-line, with dark to blackish brown hairs. Subcallus creamy grey laterally, light brown towards mid-line, and with a patch of fine creamy white hairs on each side below; parafacials and face creamy grey, with creamy white hairs on the parafacials, slightly darker ones mixed with a few dark brown on the face. *Antennae*: 1st and 2nd segments light brown, with grey tomentum, and long black hairs; 3rd bright reddish brown, darkening only at extreme tip. Palpi light brown, with a hint of greyish tomentum, more orange-brown in the deeply concave bare area; hairs fine, cream ventrally towards base, short, black elsewhere. Beard creamy white.

Thorax.—Scutum and scutellum brown, with trace of greyish overlay, and rather ill-defined, greyish dorsocentral lines, suture, and lateral area; hairs on disc black erect and dull golden recumbent; pronotal tuft dull cream, inconspicuous; notopleural hairs black; supra- and postalar tufts cream. Pleura light grey, with cream to creamy white hairs; squamal tuft bright to creamy yellow.

Legs.—Femora entirely bright yellowish brown, with mixed black and creamy hairs; tibiae somewhat darker and tarsi deeper brown, both with short black hairs dorsally, golden brown ones ventrally on distal segments.

Wings.—Greyish, with brown costal cell, and a darker brown band extending across apices of basal cells to fork of M_{3+4}; radial area vaguely darkened, most of discal cell and adjacent part of cell R_5 clearer, and variable vague darkening at apex of discal cell and fork of R_{4+5}. Veins brown; R_4 angulate, with or without short appendix; cell R_5 narrowed or closed at margin.

Abdomen.—Bright brown, with a broad, median, black patch on 1st tergite, and a narrower, interrupted black vitta on 2nd, 3rd, and 4th; 3rd and subsequent tergites darker than first 2, especially laterally, and the black markings tending to form basal bands; hairs on disc black; all tergites with a golden apical fringe and median apical cream patch; lateral hairs fairly dense, with a black patch basally on 2nd to 4th or 5th, and cream to creamy gold patches apically on all the segments. Venter pale brownish yellow basally, with irregular darker brown transverse markings on 3rd and subsequent sternites; hairs creamy white, mixed with some black ones on the darker areas. Genitalia typical for the subgenus; 8th sternite with rather prominent lateral angles, and large subtriangular gonopophyses; furca usually with wide base; cerci subtruncate apically.

There is an occasional, rather drab variant, with darker scutum, and the lateral parts of the basal abdominal tergites much darker than usual. It suggests a link with *testaceomaculata*, but the antennae, palpi, femora, and genitalia are quite typical.

The base of the furca is unusually narrow in some specimens (Fig. 134), but they, too, are quite normal in other respects.

Male (Figs. 32, 41, 123)

Similar to ♀, but more hairy, the pleural hairs often more yellowish cream, and the scutal lines often barely detectable. Eyes with upper facets not obviously enlarged, although marked off from the lower by a fairly definite line at the junction of the dark and pale hairs. Palpi subcylindrical, moderately stout, variably fawn-grey to light brown, with yellowish cream hairs on basal half and black on most of distal half. Genitalia unusually small for the size of the insect.

Distribution.—NEW SOUTH WALES: Blue Mts. (old ♀♀ in Macleay Museum—locality doubtful); Wee Jasper, Nov., Dec., Blundell; Batlow, Mar., Campbell; Alpine Ck., near Kiandra, Dec., Jan., I.M.M., Willings; Tinderry, Jan., I.M.M.; Yaouk, Taylor; Broulee (on coast), Oct., Fuller; Kosciusko (The Creel, Sawpit Ck., Island Bend, Digger's Ck., Prussian Ck., Dead Horse Gap), Dec., Jan., Feb., Chadwick, Froggatt, Goldfinch, Harper, Harrison, I.M.M., Nicholson, Taylor, Tillyard. AUSTRALIAN CAPITAL TERRITORY: Canberra, Feb.; Tidbinbilla, Jan., Mykytowycz; Blundell's, Dec., Jan., Cane, Fuller, Liepa, I.M.M., Paramonov, Tonnoir; Lee's Spring, Jan., Banyard, Norris, Willings; Bendora, Dec., Jan., Feb., Common, Grace, Liepa, I.M.M., Paramonov; Mt. Franklin, Sept., Jan., Graham, Greaves, Paramonov; Mt. Gingera, Dec., Jan., Feb., Campbell, Common, Day, Dyce, Liepa, I.M.M., Norris, Paramonov, Riek, Swan, Velous. VICTORIA: Mitta Mitta, Feb., Moffitt; Gibbo R., Jan., Fuller; Bright, Davey; Alps, Davey; Bogong High Plain, Jan., Wilson; Mt. St. Bernard, Jan., Burns; Mansfield, Feb., Philip; Dargo High Plain, Jan., Douglas; Omeo, Jan., Fuller; Mt. Buller, Jan., Wilson; Grampians, Jan., Feb., Mar., Common, Dobrotworsky; Jamieson, Dec., Campbell; Gibraltar Pt. and Hawkhurst Stn., Wonnangatta R., Dec., Campbell, Paramonov; Lake Mt., Jan., Feb., Wilson; Narbethong, Jan., Wilson; Drummer Mt., Dec., Riek; Bulgoback, Dec., Campbell; Maroondah, Mar., Dobrotworsky; Healesville, Jan., Douglas; Cabbage Tree Crk., Dec., Dobrotworsky; Mt. Donna Buang, Jan., Feb., Burns; Millgrove, Feb., Wilson; Warburton, Jan., Wilson; Powelltown (Little Ada Ck.), Feb., Dobrotworsky; Toora, Dec.; Wilson's Promontory, Jan., Nicholson.

Females are attracted fairly strongly to man, and more have been taken when attempting to bite than on *Leptospermum* flowers in the area. They are usually easy to capture, because they are not particularly shy. The larvae presumably occupy different habitats from those of *patula* or *Pelecorhynchus*, because none have been found in areas where adults of all three are almost equally abundant.

SCAPTIA (PSEUDOSCIONE) AURIPLEURA (Taylor)

**Diatomineura auripleura* Taylor, 1917*b*, p. 516; Ferguson 1920, p. 132. Type ♂ ♀, from Stradbroke I., S. Qld., September, in the Queensland Museum, Brisbane.
Scaptia auripleura (Taylor). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 296.

Material examined.—16 ♂♂, 4 ♀♀.

A relatively small species, closely related to *maculiventris* and the western *georgii*, but distinguished from both by the characters given below. Length 11–12 mm.

Female (Figs. 109, 135)

Distinguished from *maculiventris* by smaller size; almost obsolete scutal vittae; more yellowish cream to yellow supra- and postalar tufts and pleural hairs; blackish basal third to half of femora; stronger, black hind tibial fringe; more yellowish brown basal abdominal tergites, absence of contrasting median cream tufts, and more golden lateral abdominal hairs; and differently shaped 8th sternite, with bluntly rounded gonopophyses.

Distinguished from *georgii* by the more yellowish thoracic and abdominal hairs, less well-defined wing pattern, and shape of 8th sternite.

Male

Similar to ♀, but with conspicuous, median black vitta on first three abdominal tergites, 4th and subsequent tergites almost entirely black, and the lateral fringe mixed black and gold on 2nd tergite, entirely black on 3rd and 4th, and creamy yellow on subsequent tergites. Eyes and palpi similar to *maculiventris*, but pale hairs on palpi more yellowish.

Distribution.—QUEENSLAND: Dunwich, Stradbroke I., Sept., Hacker, I.M.M. NEW SOUTH WALES: Ballina; Tamworth, Froggatt.

SCAPTIA (PSEUDOSCIONE) GEORGII (Taylor)

**Erephopsis vicina* var. *georgii* Taylor, 1918, p. 57. Type ♀, from King George Sound, W.A., in the Australian Museum, Sydney.

Scaptia georgii (Taylor). Ferguson 1926*a*, p. 296.

Material examined.—3 ♂♂, 92 ♀♀.

A variable species, distinguished from its relatives in Western Australia by having the femora dark on the basal half or third, and cream apical and lateral hairs on abdominal tergites. The commoner variant will be described first.

A small to medium-sized form. Length 10–14 mm, most specimens 11–12 mm.

Female (Figs. 110, 136)

Head.—Eyes with dark brown hairs above, cream below. Frons greyish to brownish fawn, darker brown in median area, with dark brown hairs. Subcallus brown, paler in mid-line and laterally, sometimes with one or two cream hairs laterally; parafacials light to greyish fawn; face more brownish; both with cream and black hairs. *Antennae*: 1st and 2nd segments light brown, with some cream tomentum and black hairs above and distally, black and cream hairs below; 3rd orange to yellowish brown, diffusely darkening on apical annuli. *Palpi*: 1st segment fawn-grey, with short black hairs laterally, long cream ones ventrally; 2nd light brown to fawn grey, with orange-brown bare area, and short black hairs. Beard cream.

Thorax.—Scutum and scutellum dark brown, with greyish overlay anteriorly, and rather vague, grey dorsocentral lines and greyish lateral area; hairs on disc black erect and dull golden brown recumbent, with a paler patch at junction of dorsocentral lines and suture and more diffusely in front of scutellum; notopleural hairs black, variably mixed with yellow-brown; supra-and postalar tufts mixed brown and cream to yellowish. Pleura grey, with cream and yellowish cream hairs.

Legs.—Fore and mid femora black, with some greyish overlay, on basal third to half, light yellowish brown distally, hind more extensively darkened; hairs mixed black and pale golden; fore and mid tibiae yellowish brown, hind and all tarsi darker, with predominantly black hairs dorsally, yellow to brownish ventrally.

Wings.—Greyish, costal cell yellowish brown, radial area faintly darkened, a well-defined brown mark across apices of basal cells, and variable traces of darker markings at apex of discal cell and fork of R_{4+5}. Veins bright to yellowish brown; R_4 without appendix; cell R_5 moderately narrowed to closed at margin.

Abdomen.—Basal tergites somewhat yellowish to somewhat reddish brown, paler apical bands on 2nd and subsequent tergites, a blackish median patch on 1st, and an interrupted median black vitta on 2nd to 3rd or 4th, variably diffusing laterally to form black basal bands on 3rd or 4th and subsequent tergites; hairs on disc black, apical fringes of tergites black laterally, cream to golden in median zone, forming small median tufts, which widen progressively on apical tergites; lateral hairs dense, cream, variably interrupted by basal patches of black on 2nd to 4th tergites. Venter light to yellowish brown basally, dark brown subapically on 2nd and basally on subsequent sternites, and with apical paler bands on all except 1st; hairs light yellowish cream, mixed with some black in median zone posteriorly. Eighth sternite with fairly large, subtriangular gonopophyses.

Male

Similar to ♀, but pleural hairs and lateral fringe of 1st and 2nd abdominal tergites more yellowish, and lateral fringe of 3rd and 4th almost entirely black. Eyes with upper facets not obviously enlarged, but separated from lower by a line between dark and pale hairs. Palpi grey, with reddish brown bare area, and black and yellowish cream hairs.

Distribution.—WESTERN AUSTRALIA: Manjimup, Dec., Norris; 17 miles SSE. of Manjimup, Mar., McIntosh and Calaby; Pemberton and district, Nov., Mar., Mahon, McIntosh and Calaby, Norris; Warren R., Mar., Stuart; Bow R., Jan., Norris; Denmark, Jan., Norris; Walpole, Mar., Mahon; Nornalup, Dec., Swan; Albany, Jan., Newman, Norris; King George Sound.

The series from near Pemberton comprised 39 ♀♀, of which 22 agreed with the description given above, and the remaining 17 were intermediate between this and the typical form, particularly in colour of abdomen and extent of dark lateral fringe on 3rd or 4th tergites. It has not been possible to make a division between the variants, and trial sortings of the specimens at intervals have given inconsistent results, more being allotted to typical *georgii* on some occasions than on others.

Typical Form

Only 1 ♂ and 12 ♀♀ agree fully with Taylor's type, which is larger and darker than the specimens described above. Length 14–15 mm.

Female

Frons more greyish; palpi generally darker marginally; scutum blackish brown, dorsocentral lines and greyish lateral areas indefinite; beard and pleural hairs bright creamy yellow; abdomen more shining, and ground colour rich reddish brown; lateral fringe of 3rd and 4th tergites and basally on 5th entirely black, conspicuous, as in the eastern *subcontigua*. Genitalia not distinguishable from those of commoner variant.

Male

Similar to ♀, only to be separated from ♂ of commoner form by larger size, and shining red-brown abdomen.

Distribution.—WESTERN AUSTRALIA: Bunbury, Nov., Burns, Wilson; Capel; Busselton, Oct.; Warren R., Mar., Stuart; Denmark; Nornalup, ? Dec., Swan; King George Sound.

SCAPTIA (PSEUDOSCIONE) BICOLORATA (Taylor)

**Diatomineura bicolorata* Taylor, 1918, p. 60. Type ♂ ♀, from King George Sound, W.A., in the Australian Museum, Sydney.

Scaptia bicolorata (Taylor). Enderlein 1925, p. 278.

Material examined.—1 ♂, 16 ♀♀.

This small form is constantly distinguishable in the series examined, so I think that it is best treated as a sibling species. Length 9–12 mm.

Female (Fig. 137)

To be distinguished from *georgii* by: more uniformly fawn-brown marginal zone of 2nd palpal segment; generally duller cream beard, pleural hairs and scutal tufts; entirely bright yellowish to somewhat reddish brown femora, with at most a short basal blackish streak; more strongly marked wing pattern, with more evident clearer area in distal part of discal cell and adjacent part of cell R_5, and more yellowish tint in radial area just beyond the dark brown band; more or less complete cream to yellowish cream apical fringes on 2nd to 5th abdominal tergites; and black hairs in lateral fringe reduced to small basal patches on 2nd to 4th tergites. The gonopophyses of the 8th sternite are smaller than in *georgii*, but the differences are not sufficiently marked to be accepted unreservedly.

Male

Similar to ♀, except for the usual more golden coloration of thoracic and abdominal hairs, and larger black lateral tufts on 3rd to 5th abdominal tergites. Eyes as in *georgii*; palpi bright brownish yellow, with yellowish cream and some black hairs.

Distribution.—WESTERN AUSTRALIA: Bullsbrook, on flowering shrubs, Dec., Swan; Karragullen, Jan., Calaby; 15 miles E. of Pemberton, Mar., McIntosh; Albany, Dec., Jan., Norris, Swan; King George Sound.

SCAPTIA (PSEUDOSCIONE) CALABYI, sp. nov.

Pangonia jacksonii Enderlein, 1925, p. 297, nec Macquart, 1838. Three ♀♀ on which Enderlein based his genus *Astypia* were received from Professor Peus, and proved to be *calabyi*, so that *Astypia* becomes a synonym of *Pseudoscione*, not of subgenus *Scaptia*.

Types.—Holotype ♀, from 2 miles SSE. of Yornup, W.A., 4.iii.1953, McIntosh and Calaby, and allotype ♂, from Nancy Cove, Rottnest I., W.A., 11.xi.1953, J.H. Calaby, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—1 ♂, 47 ♀♀.

A medium-sized, light brown species; with no scutal vittae; light yellowish brown legs, femora darkened at most at extreme base; a single, rather faint, darker marking on wing; weakly banded abdomen; and striking rich yellow thoracic and abdominal hairs. Length 11–13 mm.

This is probably the western representative of *xanthopilis*, but the palpi are relatively shorter and narrower, and the proboscis much longer; the genitalia are, however, similar.

Female (Figs. 111, 138)

Head.—Eyes with dark brown hairs on upper half, yellowish cream ones below and laterally. Frons irregularly greyish brown, fawn along eye margins, and with rather dense, long, dark brown hairs. Subcallus greyish fawn, irregularly marked with brown, with one or two creamy hairs on each side at level of antennae; parafacials light greyish fawn, with creamy gold hairs and a few dark ones below; face similar, but with some light brown suffusion, sometimes with a few dark hairs among the pale ones below the antennae. *Antennae*: 1st and 2nd segments light creamy fawn, with long black hairs, and some creamy gold ones below and laterally on 1st segment; 3rd bright orange-brown, darkening on apical annulus. Palpi light fawn, with yellow-brown bare area, creamy gold hairs on 1st segment, and short black ones on 2nd. Beard dense, creamy yellow.

Thorax.—Scutum and scutellum uniformly dark olive, with greyish overlay anteriorly and laterally, without vittae, and rather densely covered with dull golden recumbent hairs and inconspicuous black erect ones; notopleural hairs mixed black and dull gold; supra- and postalar tufts creamy to rich yellow; marginal scutellar hairs dull golden. Pleura light grey, with dense yellow hairs, paler below.

Legs.—Light yellowish brown, femora darker at extreme base, and hind tibiae and all tarsi also darker; hairs mixed black and creamy gold on femora, a deeper gold on tibiae, black dorsally on hind tibiae and all tarsi.

Wings.—Greyish, costal cell yellow-brown, and a vague darker marking at apices of basal cells. Veins mostly light yellowish brown basally, darker distally; R_4 angulate, but without appendix; cell R_5 narrowly open, or closed at margin.

Abdomen.—Bright brown, with a yellowish tinge, and a broad blackish median mark on 1st tergite, an incomplete median black vitta on 2nd and 3rd, and irregular darker markings or bands on 4th and subsequent tergites; hairs on disc mixed rich yellow and black, and a rich yellow fringe at apices of tergites, widening in the midline to suggest a median yellowish vitta on 3rd and subsequent segments; marginal hairs rich yellow, paler on 1st and 2nd tergites, and overlaid by black on 3rd and 4th. Venter light yellowish brown, darkening irregularly in median area; hairs pale creamy gold, mixed with a few black ones on apical sternites.

Male

Similar to ♀, but black abdominal markings better defined. Upper facets of eyes not obviously enlarged; 1st antennal segment swollen; palpi bulky, subcylindrical, somewhat tapering, creamy yellow, with conspicuous black and creamy yellow hairs.

Distribution.—WESTERN AUSTRALIA: Perth (Bassendean, on tea-tree blossom, Swan R.), Dec., Newman, Swan; Rottnest I., Nov., Calaby (♂); Karragullen, Dec., Jan., Feb., Calaby, Clark, McIntosh and Calaby; Boyup Brook, Mar., McIntosh and Calaby; Greenbushes, Mar., Mahon; Yornup, Mar., McIntosh and Calaby; near Manjimup, Mar., McIntosh and Calaby; Pemberton, Feb., Calaby, McIntosh; Cape Riche, Jan., Norris; Albany, Jan., Norris; King George Sound.

SCAPTIA (PSEUDOSCIONE) XANTHOPILIS (Ferguson)

**Erephopsis xanthopilis* Ferguson, 1921*b*, p. 7, 1921*a*, p. 366 (this note antedates the description). Type ♀, from Hawkesbury R., N.S.W., November, in the Australian Museum, Sydney.

Scaptia xanthopilis (Ferguson). Ferguson 1926*a*, p. 296; Lee, Dyce, and O'Gower 1957, pp. 371, 384.

Material examined.—123 ♀♀.

A broadly built species, close to *calabyi*, but distinguished by larger size, different palpi (Fig. 112), and darker abdominal coloration, with a median black vitta basally, and the apical segments entirely black. Length 13–15 mm. The relatively large palpi and general resemblance to *lasiophthalma* suggest relationship with the *concolor* subgroup, as well as the *maculiventris* subgroup.

Female (Figs. 112, 139; Plate 2, Fig. 17)

Head.—Eyes green in life; hairs dark brown above, yellowish cream below. Frons fawn-grey, with dark brown hairs. Subcallus yellowish fawn laterally, brown centrally, without hairs; parafacials and sides of face yellowish fawn, centre of face more brownish, both with bright creamy yellow and some black hairs. *Antennae*: 1st and 2nd segments fawn-brown, with black hairs; 3rd bright orange, darkening at tip. Palpi bright fawn-brown, with orange-yellow concavity, yellowish cream hairs at base, and short black ones distally. Beard yellowish cream.

Thorax.—Scutum and scutellum dark grey, with thin greyish overlay, inconspicuous erect black hairs, and patchy appressed dull golden hairs; notopleural hairs mixed black and dull golden; supra- and postalar tufts yellow. Pleura grey, with mustard yellow hairs anteriorly and above, yellowish cream below.

Legs.—Femora black basally, bright yellowish brown distally, with predominantly creamy yellow hairs; fore and mid tibiae yellowish brown, hind tibiae and all tarsi darker, hairs predominantly brown to black.

Wings.—Greyish, more yellowish brown in costal cell, and usually with trace of darkening across apices of basal cells. Veins bright yellowish brown, median group and $1A$ darker; R_4 strongly curved, without appendix; cell R_5 closed, short-petiolate.

Abdomen.—First, 2nd, and basal part of 3rd tergites rich reddish brown, with a median black vitta; apical part of 3rd and all subsequent tergites black. Hairs on disc black; creamy golden median and lateral apical patches on 1st tergite, a median patch on 2nd, and wider zones and incipient median triangles on subsequent tergites; marginal hairs creamy gold on 1st and 2nd tergites, black above creamy gold on 3rd and 4th, almost entirely black on 5th, creamy gold on 6th, and black at apex of abdomen. Venter with 1st sternite pale yellow, remainder rich reddish brown, paler laterally on 2nd and 3rd sternites, sometimes becoming almost black towards apex of abdomen; hairs creamy gold, mixed with black on darker areas.

Some southern specimens have the veins clouded with yellowish brown, and 3rd abdominal tergite entirely black. These may be confused with the specimens of *lasiophthalma* in which the dark markings on the wings are ill-defined.

Distribution.—QUEENSLAND: Blackbutt, Dec.; Cunningham's Gap, biting, Nov., I.M.M.; Binna Burra, Nov., I.M.M.; Eukey, Jan., Wilson. NEW SOUTH WALES: Tenterfield, Jan.; Dorrigo, Jan., Feb., F.D., Wright; Pt. Lookout, near Ebor, Dec., M. & M.; Comboyne, Sept.-Dec., Pfeiffer; Wingham, Nov., Pfeiffer; Barrington Tops (Gummi R., Carey's Peak), Jan., Feb., Mar., Hopson, McMillan, S.U. Zool. Exp.; Eccleston, Feb.; Raymond Terrace, on cow, Froggatt; Cooranbong, Jan., McMillan; Milson I., Hawkesbury R., Cleland; Broken Bay, Jan., I.M.M.; Avalon, Dec., Day; Mt. Irvine, in scrub, Feb., Froggatt, Taylor; Kurrajong, Jan., Feb., Taylor, D. F. Waterhouse; Mt. Tomah, Feb., Taylor; Mt. King George, Dec., Henry; Blackheath, Feb., I.M.M.; Green Gully, Dec., McMillan; Sydney (Hornsby), Dec., Jan., Lee, McMillan; Waterfall, National Park, Feb., I.M.M.; Cordeaux R., Feb., McNamara; Colo Vale, Jan., Feb., Mar., Dyce, Lee, Lewis, O'Gower, Wirth; Tabourie, Dec., Mar., Hill; Durras, Dec., Jan., Hill and Greaves; Merimbula, Dec., Ratcliffe. VICTORIA: Bright, Feb., Davey, Riek.

The females attack man fairly freely, especially in forest country. They are so common that it is curious that no males have been collected.

SCAPTIA (PSEUDOSCIONE) SUBCONTIGUA (Ferguson)

**Erephopsis subcontigua* Ferguson, 1921*b*, p. 5. Type ♀, from Meldrum, N.S.W., December, in the Australian Museum, Sydney.

Scaptia subcontigua (Ferguson). Ferguson 1926*a*, p. 296.

Material examined.—74 ♀♀.

A robust, dark species; with cream beard; dark brown, almost avittate scutum; mainly blackish femora; and shining, rich red-brown abdomen, with a narrow, variable, often interrupted, median black vitta, and small white apical hair tufts on tergites. Length 14–16 mm. The relatively long palpi and dark wing pattern suggest relationship with the *concolor* subgroup.

Female (Figs. 114, 141; Plate 2, Fig. 18; Plate 4, Fig. 34)

Head.—Eyes with dark brown hairs above, paler on lower fourth. Frons dark brown, fawn along eye margins, with blackish brown hairs. Subcallus brown, more greyish on each side, with a few cream hairs laterally; parafacials greyish fawn, with cream and dark brown hairs; face brown, with some greyish reflections, and mixed dark brown and cream hairs. *Antennae*: 1st and 2nd segments brown, with greyish tomentum, and black hairs, some pale ones below and laterally on 1st segment; 3rd bright reddish brown, darkening to deep brown on apical annuli. *Palpi*: 1st segment greyish brown, with cream hairs ventrally; 2nd greyish brown, with dark reddish brown concavity, and short black hairs. Beard cream, sometimes with a yellowish tint.

Thorax.—Scutum and scutellum dark brown, with obscure brown dorsocentral lines and lateral areas, and a grey spot at junction of dorsocentral lines and suture; hairs on disc black erect and fine dull golden to brown appressed. Pronotal hairs cream; notopleural hairs black, forming a dark band along side of scutum; supra-alar tuft mixed black and yellowish cream; postalar tuft cream, conspicuous. Pleura grey, with yellowish cream propleural and squamal tufts, a dense, dull cream zone forming a conspicuous band above the black hairs on upper mesopleural convexity, and pale cream elsewhere.

Legs.—Femora blackish basally, brown on apical fourth of fore and mid legs and tip of hind leg; tibiae and tarsi brown, the hind legs darker than the others; hairs black and yellowish cream on femora, predominantly black elsewhere, hind tibial fringes short but strong.

Wings.—Faintly brownish, with the apical fourth distinctly clouded, clear areas in the basal cells, distal half of discal cell, and adjacent part of cell R_5, a strong dark band across apices of basal cells, and a trace of one more distally, reaching apex of discal cell. Veins bright to dark brown; R_4 without appendix; cell R_5 narrowly open or closed at margin.

Abdomen.—Shining, rich red-brown; 1st tergite paler, with a median black patch; 2nd to 4th or 5th with a narrow, variable black vitta, which usually widens posteriorly, and is sometimes reduced to a series of elongate spots; apical tergites generally darker; hairs on disc black, except for some inconstant, small, median apical tufts of yellowish cream on 2nd to 5th tergites; marginal hairs dense, in alternating patches of black and yellowish cream on 1st and 2nd tergites, entirely black on 3rd to 5th, a cream patch at side of 6th, and 7th with entirely black hairs. Venter shining reddish brown, brighter basally, darker in median zone, and with apices of sternites vaguely paler; hairs pale to creamy gold on most of sternites, variably black in median zone. Genitalia normal, with moderately large subtriangular gonopophyses.

Distribution.—QUEENSLAND: Eukey, Jan., Wilson. NEW SOUTH WALES: Chandler's Ck., Jan.; Brooklana, Dec., Froggatt; Dorrigo, Dec.; Meldrum, Oct., Nov., Dec., Raven; Deervale, Dec.; Barwick R. and Pt. Lookout, near Ebor, biting and on *Leptospermum*, Dec., M. & M.; Armidale, Oct., Nov., Raven; "Nianola", near Walcha, "frightens horses", Jan., McLernon.

SCAPTIA (PSEUDOSCIONE) RUFONIGRA (Ferguson)

**Erephopsis rufoniger* Ferguson, 1921*b*, p. 6. Type ♀, from Armidale, N.S.W., in the Australian Museum, Sydney.

Scaptia rufoniger (Ferguson). Ferguson 1926*a*, p. 296.

Material examined.—4 ♀♀.

This species appears to be rare, and I have only seen the original series. It is close to *subcontigua*, but I think that it is distinct.

Female (Figs. 113, 140)

Smaller (11–12 mm) and more rotund; palpi shorter, and differently shaped (Fig. 113), more deeply excavated laterally; a vague yellowish zone above the black notopleural hairs; postalar tuft dull yellow; femora darkened only at base; hind tibial fringes mixed black and brown-gold; cell R_5 only slightly narrowed; median black vitta on abdomen wider, no median apical pale tufts (all specimens somewhat rubbed), but diffuse creamy yellow hairs on 5th and subsequent tergites, and black tufts at sides of 2nd to 4th mixed with creamy yellow hairs; venter without evident median darkening or black hairs; gonopophyses of 8th sternite somewhat smaller and more rounded.

Distribution.—NEW SOUTH WALES: Meldrum, Oct., Raven; Deervale, Dec.; Armidale, Oct., Raven.

The concolor *Subgroup*

SCAPTIA (PSEUDOSCIONE) LASIOPHTHALMA (Macquart)

**Pangonia lasiophthalma* Macquart, 1834, p. 193; Boisduval 1835, p. 666 (attributed to Meigen, but figured in pl. XII, fig. 13, 1832, as "*Pangonie fuligineuse* Boisd."); Walker 1854, p. 139; Ricardo 1900*a*, p. 114. Type ♀, in the Paris Museum. It has two identification labels, one reading "*Pangonia fuliginosa* B.", and the other "*Pangonia lasiophthalma*". Macquart gave "Nouvelle-Guinée" and Boisduval "Cap Jervis" in their descriptions; but the label on the specimen looks more like "Jervis Bay" than "Jervis Cap". Ferguson (1924) was, therefore, correct, not only in the identity of the species, but apparently also in his guess at the true type locality.

Erephopsis lasiophthalma (Boisduval). Surcouf 1921, p. 120. Not Ricardo 1917, p. 210; Taylor 1917*b*, p. 517, 1918, p. 56; Ferguson 1920, p. 131, 1921*a*, p. 366 (all = *maculiventris* Westwood). Not Taylor 1919, p. 42 (= *gemina* Walker).

Lilaea lasiophthalma (Boisduval). Enderlein 1925, p. 297.

Osca lasiophthalma (Macquart). Ferguson 1924, p. 257 (see for full discussion).

Scaptia lasiophthalma (Macquart). Ferguson 1926*a*, p. 296.

Scaptia (*Pseudoscione*) *lasiophthalma* (Macquart). Mackerras 1956*a*, pl. 1, fig. 3.

**Pangonia contigua* Walker, 1848, p. 138, 1854, p. 140 (syn. of "*fuliginosa* Boisd."). Type ♀, from Australia, in the British Museum (Natural History).

Erephopsis contigua (Walker). Ricardo 1900*a*, pp. 112, 116, 1915*b*, p. 25; Ferguson and Henry 1920, p. 835; Surcouf 1921, p. 119; Ferguson 1920, p. 131, 1924, p. 257 (syn. of *lasiophthalma* Macquart).

Lilaea contigua (Walker). Enderlein 1925, p. 297.

**Pangonia maculipennis* Macquart, 1850, p. 20; Schiner 1868, p. 99. Type ♀, from east coast of New Holland, in the Paris Museum.

Erephopsis maculipennis (Macquart). Ricardo 1900*a*, p. 106, 1915*b*, p. 23; Surcouf 1921, p. 120; Ferguson 1924, p. 257 (syn. of *lasiophthalma* Macquart). Not Ricardo 1917, p. 209; Taylor 1918, p. 56; Ferguson 1921*a*, p. 366 (all = *guttipennis* Ferguson).

Lilaea maculipennis (Macquart). Enderlein 1925, p. 297.

Pangonia fuliginosa Walker, 1854, p. 140; Surcouf 1921, p. 120 (syn. of *lasiophthalma* Boisduval). The name was Walker's latinization of "*Pangonie fuligineuse*" of Boisduval.

Ferguson (1924) has discussed the complicated synonymy of this coastal species. In brief, it was generally known as *contigua* Walk.; the name *lasiophthalma* Boisd. was applied to the montane species which is now known as *maculiventris* Westw.; and *maculipennis* Macq. was applied to the South Australian species which was later described as *guttipennis* Ferg.

Material examined.—25 ♀♀.

A robust, dark species, with relatively long palpi, yellow beard and pleural hairs, blackish grey scutum, 2 dark bands on wing, and abdomen reddish brown on basal half, black on apical half. Length 13–15 mm. Easily recognized within the subgroup by thoracic and abdominal coloration; and to be separated from *xanthopilis* (*maculiventris* subgroup) by larger size, longer palpi, paler yellow beard and thoracic hairs, wing pattern, and somewhat differently shaped gonopophyses.

Female (Figs. 115, 142; Plate 1, Fig. 7)

Head.—Eyes green in life; with brown hairs above, creamy yellow below. Frons greyish fawn, diffusely brown in median zone, with dark brown hairs. Subcallus brown, paler laterally, with two or three cream hairs on each side; parafacials creamy fawn, with yellowish cream hairs mixed with a few dark ones; face light brown, with pale greyish overlay, and mixed yellowish cream and black hairs. *Antennae*: 1st and 2nd segments fawn, with black hairs, except for some yellowish cream ones below on 1st, 3rd bright brownish orange, darkening at tip. *Palpi*: 1st segment light yellowish, with yellowish cream hairs; 2nd fawn-cream, with short black hairs marginally, the concave bare area bright brownish yellow, and a few creamy yellow hairs below. Beard creamy yellow.

Thorax.—Scutum and scutellum blackish grey, with some overlying paler grey tomentum, but without evident vittae; hairs on disc erect black and appressed dull creamy yellow, densest in front of and on scutellum. Notopleural hairs mixed black and dull yellow; supra- and postalar tufts creamy to bright yellow, with some black hairs above. Pleura grey, with dense yellow hairs on pronotal and upper part of mesopleural convexities, creamy yellow elsewhere; squamal tuft cream.

Legs.—Fore and mid legs bright yellowish brown, darkening somewhat basally on femora and distally on tarsi; hairs predominantly creamy yellow on femora, predominantly black on other segments; hind legs contrasting, deep to blackish brown, somewhat paler on apical third of femora; femora with pale golden and black hairs, remaining segments with rich brown hairs ventrally, black dorsally, tibial fringes dense.

Wings.—Greyish, clearer in basal and discal cells, more yellowish in basal part of radial area, and more brownish distally; base and costal cell yellowish brown; one irregular dark brown band extending across apices of basal cells, and a second from anterior border back across apex of discal cell, and diffusing into the brownish grey apical colour; the extent and sharpness of the two bands varies considerably. Veins yellowish brown at basal part of radial area and around basal cells, darker brown elsewhere; R_4 more or less angulate, but without appendix in the specimens examined; cell R_5 closed.

Abdomen.—Similar to *xanthopilis*; 1st tergite reddish brown, with a vague darker central marking; 2nd reddish brown, with an incomplete narrow black median vitta, and a variable amount of black along hind border; 3rd variably reddish brown at base, mostly black; subsequent tergites entirely black. Hairs on disc black, except for a variable median zone of dull cream hairs at apices of all tergites; marginal hairs dense, predominantly yellowish cream on 1st and 2nd tergites, black, with some cream ones below but hidden in dorsal view, on 3rd and 4th, a cream to yellowish cream tuft on 5th and 6th, entirely black on 7th. Venter with 1st sternite cream-yellow, 2nd bright brown, 3rd and subsequent sternites dark reddish brown, with vague blackish markings; hairs yellowish cream, black in median zone, with a pale apical fringe on the lateral third of all sternites.

Occasionally the darker markings on the wings are rather vague, and these specimens need to be distinguished from specimens of *xanthopilis* in which the markings are relatively well developed.

Distribution.—NEW SOUTH WALES: Kendall, Nov., Dec.; Tabourie, Feb., Mar., Hill; Bawley Point, Jan., Nicholson; Durras, Jan., Feb., Hill and Greaves; Mossy Point, Feb., D. F. Waterhouse; Moruya, Dec., G.W.C. AUSTRALIAN CAPITAL TERRITORY: Canberra, Dec., Nicholson. VICTORIA: Cabbage Tree Ck., Feb., Dobrotworsky.

Two females from Boompa, Qld., may be a dark variant, but are not in sufficiently good condition for determination.

SCAPTIA (PSEUDOSCIONE) QUADRIMACULA (Walker)

**Pangonia quadrimacula* Walker, 1848, p. 138. Type ♀, from Australia, in the British Museum (Natural History).

Erephopsis quadrimacula (Walker). Ricardo 1900*a*, pp. 112, 116; Ferguson and Henry 1920, p. 835; Ferguson 1920, p. 131, 1921*a*, p. 365; Surcouf 1921, p. 120.

Lilaea quadrimacula (Walker). Enderlein 1925, p. 297.

Scaptia quadrimacula (Walker). Ferguson 1926*a*, p. 296.

Material examined.—64 ♀♀.

A robust, striking, dark species, with reddish brown legs, darkly patterned wings, and shining, deep reddish brown abdomen with a conspicuous subapical white fleck of hairs at sides of 5th and 6th tergites. Length 13–15 mm.

Female (Figs. 116, 143; Plate 4, Fig. 35)

Head.—Eyes with brown hairs, paler below. Frons brown, with a fawn tint near eye margins, and with dark brown hairs. Subcallus brown, fawn near eyes, with a single hair on each side; parafacials light fawn, with a brown patch below, and dark brown hairs; face brown, slightly shining, with dark brown hairs. *Antennae*: 1st and 2nd segments light brown, with black hairs; 3rd orange-brown, darkening slightly apically. *Palpi*: 1st segment fawn-brown, with cream hairs; 2nd light brown marginally, with slightly concave, rich reddish brown bare area, short, black marginal hairs, and a few cream ones at base below. Beard cream, sometimes with a yellowish tinge.

Thorax.—Scutum and scutellum rich chocolate brown, rather shining, but with indications of greyish tomentum anteriorly and laterally; vittae barely indicated; hairs on disc erect black and appressed dull gold; notopleural hairs mixed black and dull gold; supra- and postalar tufts brownish black, with some fine creamy hairs beneath on upper part of postalar declivity. Pleura fawn-grey, with cream hairs, yellowish on upper margin and centre of mesopleural convexity, and some black ones below it.

Legs.—Fore and mid legs bright brown, with black hairs; hind legs somewhat darker, more reddish brown, mainly with black hairs, but some white to cream ones basally on femora and red-brown ventrally on tibiae and tarsi.

Wings.—Brownish grey, more yellowish anteriorly, and with clearer areas in the basal cells and between the two dark markings; almost the whole of the radial area from the fork of Rs to the tip of R_{2+3} deep brown, with a yellowish area at level of tip of sc, but with distal part of cell R_3 not included; the dark colour extends posteriorly in the two bands characteristic of the subgroup. Veins yellowish brown basally, bright brown distally; R_4 strongly curved, but without appendix; cell R_5 closed, short-petiolate.

Abdomen.—Rich brown, with a reddish hue, and vague blackish markings which tend to form narrow apical black bands on the tergites; hairs on disc entirely black; marginal hairs dense, black, with an apical white fleck on 1st tergite, mainly white on 2nd, entirely black on 3rd and 4th, conspicuously white on 5th and 6th, and black on 7th. Venter rich mahogany brown, with black hairs in median area, inconspicuous whitish ones laterally, and fairly well-defined white fringes at apices of 2nd to 4th sternites.

This description is based on fresh specimens; those that have been long in collection are considerably duller in general coloration.

Distribution.—NEW SOUTH WALES: Coff's Harbour, Dec., F. Dodd; Pt. Lookout, near Ebor, biting in forest, Dec., Jan., M. & M.; Comboyne, Dec., Pfeiffer; Barrington Tops (Carey's Peak), Jan., S.U. Zool. Exp.; Stroud, Dec., McMillan.

SCAPTIA (PSEUDOSCIONE) CONCOLOR (Walker)

**Pangonia concolor* Walker, 1850, p. 14. Type ♂ ♀, from south Queensland, in the British Museum (Natural History). The ♀ is selected as lectotype.

Diatomineura concolor (Walker). Ricardo 1900*a*, pp. 113, 118; Surcouf 1921, p. 130.

Erephopsis concolor (Walker). Ferguson and Henry 1920, p. 835; Ferguson 1920, p. 131, 1921*a*, p. 366.

Scaptia concolor (Walker). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 296; Hardy 1940, p. 485.

Pangonia roei Enderlein, 1922, p. 341, 1925, p. 297, nec Macleay, 1826 (erroneously attributed to King), type species of *Lilaea* Enderlein nec Walker. A ♀ det. Enderlein as *Lilaea roei* (King) was received from Professor Peus, and proved to be typical *concolor* Walker.

Material examined.—43 ♀♀.

A relatively dull, almost uniformly brown species, with creamy white beard and pleural hairs, inconspicuous, brown supra- and postalar tufts, light brown legs, and almost entirely dull golden to reddish hairs on abdominal tergites. Length 13–15 mm, most specimens about 14 mm.

Female (Figs. 117, 144)

Head.—Eyes with dark brown hairs, brighter brown near lower margin. Frons brown, with a reddish tint where rubbed, paler laterally, with dark brown to black hairs. Subcallus brown, paler laterally, without hairs; parafacials variably fawn-cream to brown, with dark brown hairs; face brown, slightly shining, with dark brown hairs. *Antennae*: 1st and 2nd segments light brown, with cream tomentum, and black hairs; 3rd almost uniformly bright brownish yellow. Palpi large (Fig. 117); 1st segment fawn-cream, with white hairs; 2nd brown, with black hairs marginally, reddish to orange-brown on almost flat bare area. Beard creamy white.

Thorax.—Scutum and scutellum almost uniformly dull brown, sometimes with a faint reddish tint, and with thin greyish overlay anteriorly and laterally; hairs on disc erect black and appressed dull yellow-brown; notopleural hairs black and mixed black and brown; supra- and postalar tufts and marginal scutellar hairs brown, inconspicuous. Pleura grey, with cream to creamy white hairs.

Legs.—Light, almost yellowish brown, brighter brown on hind legs and all tarsi; hairs predominantly cream on femora, yellowish on fore and mid tibiae and tarsi, and reddish on hind tibiae and tarsi; a variable mixture of black in some specimens on fore and mid femora and dorsally on fore and mid tibiae.

Wings.—Pattern normal for subgroup, but less conspicuous than in *quadrimacula*, and distal dark band often relatively vague. Veins mainly yellow-brown; R_4 angulate, with or without trace of appendix; cell R_5 usually closed at margin, sometimes narrowly open.

Abdomen.—Almost uniformly brown, with a vague yellowish tint, small, irregular darker markings on some tergites, and their apical margins somewhat paler; hairs on disc almost uniformly dull yellow to golden brown, inconspicuously mixed with black sublaterally on basal tergites of some specimens; marginal hairs relatively short, cream to yellowish on 1st and 2nd tergites, richer golden to golden brown on subsequent tergites. Venter shining brownish yellow, with cream hairs, vaguely darker and with some black hairs in median zone.

Distribution.—QUEENSLAND: Eidsvold, Bancroft; Upper North Pine R., Jan.; Camp Mt., biting horse, Dec., Marks; Pimpema, Nov., Henderson; Mt. Tamborine, Davidson; Nerang, Oct. NEW SOUTH WALES: Tooloom, Jan.; Dorrigo, Jan., Wright; Wauchope, Goodacre; Kendall, Jan., Feb.; Wollamba R., Feb.; Myall Lakes, Jan., Graham; Sydney (Auburn), May (British Museum).

SCAPTIA (PSEUDOSCIONE) NEOCONCOLOR, sp. nov.

Types.—Holotype ♀, from Bramston Beach, N. Qld., 15.ix.1949, M. J. Mackerras, and allotype ♂, from Kuranda, N. Qld., F. P. Dodd, in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—1 ♂, 56 ♀♀.

This is the northern representative of *concolor*, but it is smaller, more shining, and differs in other respects given below, including the genitalia. Length 12–14 mm, most specimens 12–13 mm.

Female (Fig. 145; Plate 2, Fig. 19)

Head.—Frons with a more definite keel, more reddish where rubbed, and with paler fawn-grey tomentum laterally than in *concolor*; face more shining brown in central area.

Thorax.—Scutum with a characteristic red-violet hue; notopleural hairs almost all black, conspicuous; supra- and postalar tufts and marginal scutellar hairs yellowish cream. Pleura with a faint underlying pinkish hue; propleural tuft and tuft on upper margin of mesopleural convexity yellowish.

Legs.—Femora lighter yellowish brown than in *concolor*, and hind tibiae and all tarsi more contrasting darker brown, with predominantly black hairs.

Wings.—More strongly patterned; veins dark brown; R_4 strongly curved, but without appendix.

Abdomen.—Shining; 1st and 2nd tergites brownish yellow, 3rd and subsequent tergites richer brown, with vague but more extensive black markings, and apices of all tergites paler; hairs on disc black, except for inconspicuous, median apical yellowish tuft on 2nd or 3rd to 5th or 6th tergites; marginal hairs golden to creamy gold, sometimes with some black hairs at basal corners of 3rd and 4th tergites. Venter similar to dorsum, with golden hairs. Gonopophyses (Fig. 145) smaller and more rounded than in *concolor*.

Male

Similar to ♀, but without the reddish violet tint, with upper pleural hairs more definitely yellow, and a strong mixture of black in the lateral abdominal fringe. Upper facets of eyes distinctly enlarged, but merging into smaller lower and posterior facets. Palpi stout, tapering, yellowish cream, with brown bare area and predominantly black hairs, except for some creamy yellow ones basally and below. Cell R_5 only moderately narrowed on one wing, almost closed on the other.

Distribution.—QUEENSLAND: Ellis Beach, Oct.; Kuranda, Dodd, Taylor; Cairns, Oct., Dodd, Mules, Wild; "Cascades", Freshwater Ck., Oct., M.J.M.; Gordonvale; Mulgrave R.; Bramston Beach, biting, Sept., M.J.M.; Tully, Oct., Taylor; Little Crystal Ck., Mt. Spec, biting, Dec., M.J.M.; Mt. Spec Rd., on windscreen of car, Nov., M.J.M.

SCAPTIA (PSEUDOSCIONE) AUREOHIRTA (Ricardo)

**Erephopsis aureohirta* Ricardo, 1900*a*, pp. 112, 116, 1915*b*, p. 23, 1917, p. 211; Taylor 1917*a*, p. 746; Ferguson 1921*a*, p. 366; Surcouf 1921, p. 119. Type ♀, from Mackay, N. Qld., in the British Museum (Natural History).

Lilaea aureohirta (Ricardo). Enderlein 1925, p. 297.

Scaptia aureohirta (Ricardo). Ferguson 1926*a*, p. 296, fig. 4.

Material examined.—4 ♂♂, 20 ♀♀.

A moderately dark species; distinguished by the relatively dense covering of yellow hairs on scutum; yellow pleural tufts; blackish to dark brown legs; bifasciate wing pattern; yellow-brown basal segments of abdomen contrasting with blackish apical segments, and dense white lateral tufts on 6th and 7th tergites. Length 13–14 mm.

Female (Figs. 118, 146)

Head.—Eyes with brown hairs above, cream below and laterally. Frons greyish fawn, more brownish and slightly raised in centre, with dark brown hairs. Subcallus fawn-brown, paler laterally, with a few hairs on each side; parafacials creamy fawn, with yellowish cream hairs; face more brownish, with thin, fawn-cream tomentum, and some yellowish cream and dark brown hairs laterally. *Antennae*: 1st and 2nd segments light brown, with cream tomentum, and black hairs above, some cream ones below; 3rd bright orange-yellow, darkening at extreme tip. Palpi shorter than usual in subgroup; 1st segment fawn-brown, with cream hairs below, and some black ones laterally; 2nd bright, somewhat yellowish brown, with black hairs, and with a concave, bright orange-brown bare area. Beard yellowish cream.

Thorax.—Scutum and scutellum dark brown, with some greyish overlay anteriorly and laterally, without indications of vittae, and rather densely covered with appressed dull golden hairs; notopleural hairs mixed yellow, brown and black; supra- and postalar tufts and marginal scutellar hairs dense, dull yellow. Pleura grey, with yellow hairs above, more creamy yellow below; squamal tuft bright cream, with a tinge of yellow.

Legs.—Fore and mid femora and whole of hind legs deep, almost blackish brown, fore and mid tibiae and tarsi not as dark; hairs predominantly black, mixed with light yellow on femora, and with a yellowish to reddish ventral zone on fore and mid tibiae and tarsi and hind tarsi.

Wings.—Greyish, with a yellowish hue anteriorly, and the characteristic dark markings of the subgroup. Veins yellow-brown to brown; R_4 angulate, sometimes with trace of appendix; cell R_5 closed, short-petiolate.

Abdomen.—First and 2nd and a variable amount of 3rd tergites bright brownish yellow, a little darker in median area, and covered with bright yellow hairs; remainder of 3rd and subsequent tergites dark brown, becoming blackish towards apex of abdomen, and covered with black hairs, variably mixed with yellow, and with inconstant yellow apical fringes on 3rd and some of subsequent tergites; lateral hairs bright yellow on 1st and 2nd segments, black on 3rd to 5th, forming a conspicuous white tuft on 6th and 7th, and with median portion of 7th with black hairs. Venter similar to dorsum, with creamy yellow hairs on first three or four sternites and an increasing mixture of black hairs more posteriorly.

Male

Similar to ♀, but scutal hairs predominantly darker, pleural and abdominal hairs a richer yellow, a better defined median black patch on 1st and 2nd tergites, and a sharper division between the paler first 3 and black apical tergites. Eyes with upper facets not obviously enlarged. Palpi subcylindrical, bright brown, with orange-brown bare area, and creamy yellow to black hairs.

Distribution.—QUEENSLAND: Kuranda, Nov., Dodd, Goldfinch; Cairns, Oct., Nov., Dec., Clark, Wild; Mareeba, Jan., Burns (an unusually large, dark ♀); Bowen, Simson; Mackay, Turner (British Museum); Plane Ck., near Sarina, Nov.; Yeppoon, Oct., Nov., Goldfinch; Rockhampton; Bouldercombe, Dec., Fenelon; Westwood, Oct., Goldfinch. NEW SOUTH WALES: Coff's Harbour, Oct., Dobson (♂, identity doubtful).

SCAPTIA (PSEUDOSCIONE) ROEI (Macleay)

Pangonia roei Macleay, 1826, p. 467; Ricardo 1900*a*, p. 114; Surcouf 1921, p. 128 (as *Pangonius*); Hardy 1941, p. 233. Not Walker 1848, p. 145, 1854, p. 145 (probably = *Austroplex brevipalpis* (Macquart), according to Ferguson 1926*a*, p. 304); not Enderlein 1922, p. 341, 1925, p. 297 (= *concolor* Walker). No specific locality was given, and no type specimen has been found. In order to settle the identity of the species, I now select the type ♀ of *Corizoneura conspicua* Ricardo, 1915, in the National Museum, Melbourne, as neotype of *Pangonia roei* Macleay, 1826.

**Corizoneura conspicua* Ricardo, 1915*b*, p. 37; Surcouf 1921, p. 134; Enderlein 1925, p. 271. Type ♀, from Endeavour R., N. Qld., in the National Museum, Melbourne.

Scaptia conspicua (Ricardo). Ferguson 1926*a*, p. 303.

**Copidapha bifasciata* Enderlein, 1925, p. 270; Ferguson 1926*a*, p. 303 (syn. of *conspicua* Ricardo). Type ♀, from Endeavour R., N. Qld. in the Berlin Museum. It is mounted similarly, has similar labels, and is clearly from the same series of specimens as Miss Ricardo's type.

Ricardo (1915*b*) and Ferguson (1926*a*) both suggested that her species might be *Pangonia roei* Macleay. I have compared Macleay's brief description with all the species of the subgroup, and concluded that this is the only one that it will fit. The only locality where the species has certainly been collected was visited by King during his survey.

Material examined.—1 ♂, 7 ♀♀.

A brown species, with bright yellow beard, thoracic hair tufts, and lateral abdominal hairs. Distinguished from *aureohirta* by bare eyes (in ♀), wider frons, different palpi, and entirely brown abdomen, with the lateral hairs entirely yellow in ♀. Length 14–16 mm. Described from old specimens in fair condition.

Female (Figs. 119, 147)

Head.—Eyes almost completely bare, sparse, short hairs being only just detectable at × 35. Frons wider than in other members of the subgroup, brown in centre, fawn-cream laterally, with short, scanty, inconspicuous brown hairs. Subcallus brown, fawn-cream marginally, without hairs; parafacials brown, irregularly fawn-cream above, with a few short hairs towards lower margin; face protuberant, not shining, fawn-cream, brown below, with short brown and cream hairs. *Antennae*: 1st and 2nd segments light brown, with cream tomentum, and short black hairs; 3rd light orange-yellow. *Palpi*: 1st segment fawn, with mixed black and short yellowish hairs; 2nd brown, orange-brown on the slightly convex bare area, which is surrounded by short, dense, black hairs. Beard yellow.

Thorax.—Scutum and scutellum rather deep shining brown, with some greyish brown reflections on shoulders and laterally, and, at most, traces of median and dorsocentral lines; hairs on disc short, golden; notopleural hairs dark brown, mixed with some dull gold; supra- and postalar tufts bright yellow. Pleura light grey, with rich yellow hairs, and some creamy yellow below; squamal tuft bright yellowish cream.

Legs.—Femora and hind tibiae and tarsi deep brown; fore and mid tibiae and tarsi not as dark; hairs black.

Wings.—Almost hyaline, with base, costal cell, and distal part of cell R_1 brown, the first dark band extending to Cu_1, and the second just past M_2. Veins brown; R_4 strongly curved, without appendix; cell R_5 only moderately narrowed.

Abdomen.—Almost uniformly shining, bright, somewhat yellowish brown, with vague darker markings on some of the tergites; hairs mixed black and golden, with a fairly conspicuous median golden patch on 1st tergite, and indications of similar golden hairs on 2nd to 3rd or 4th; marginal hairs moderately dense, bright golden. Venter similar to dorsum; hairs golden, most concentrated at apices of sternites.

Male

I have seen a single, headless ♂. It resembles the ♀, but is darker, with more richly yellow hair tufts, and fairly numerous black hairs among the yellow at the sides of 3rd and 4th abdominal tergites. Ferguson (1926*a*, p. 303) described the eyes as densely pubescent. The genitalia are normal for the subgenus.

Distribution.—QUEENSLAND: Endeavour R.; Cooktown; ?Rockhampton (old specimens in Macleay Museum). No dates given.

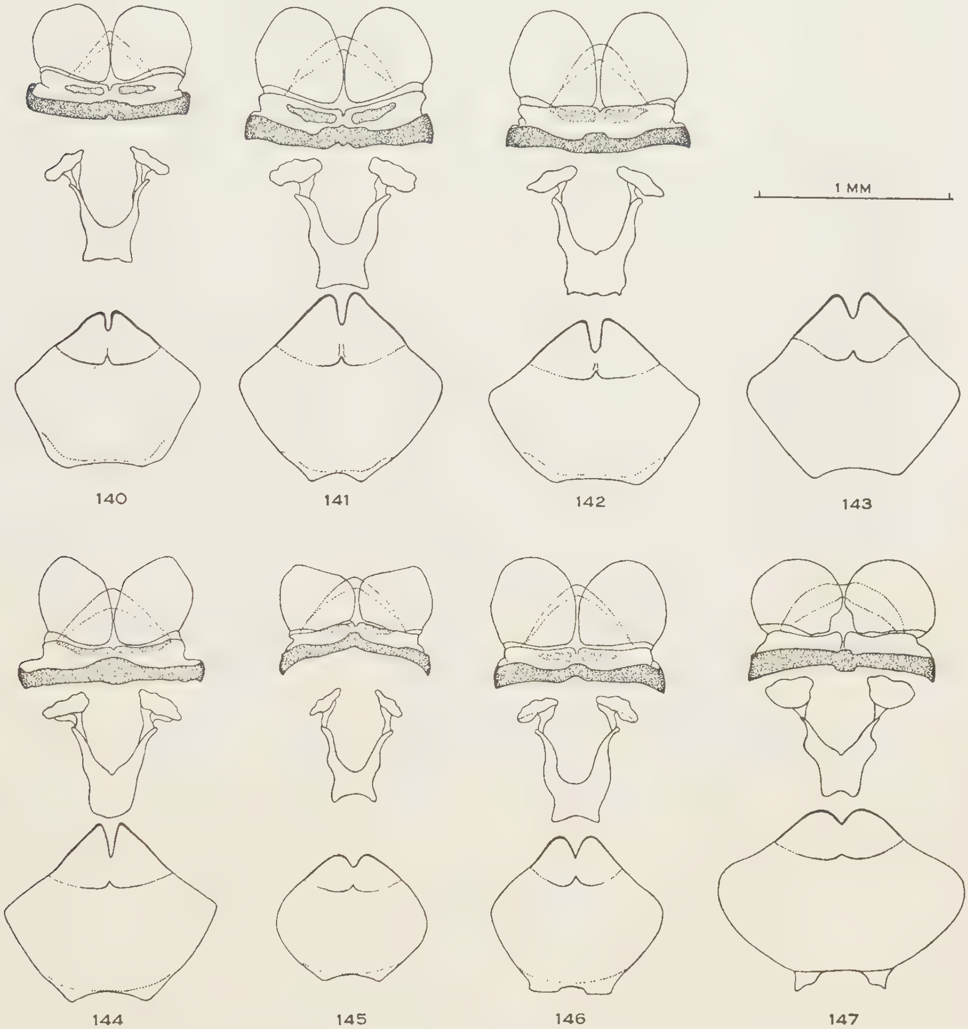
Not Grouped

SCAPTIA (?PSEUDOSCIONE) ANOMALA, sp. nov.

Types.—Holotype ♀, from near Warburton, Vic., 25.i.1942, F. Erasmus Wilson, in Mr. Wilson's collection, Melbourne; allotype ♂, from Mt. Gingera, A.C.T., 3.i.1951, S. J. Paramonov, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—3 ♂♂, 1 ♀.

A small, dark, hairy species, with very slender palpi, grey beard, clear wings, and dull creamy to yellowish apical hairs on abdominal tergites. Length 9–10 mm.



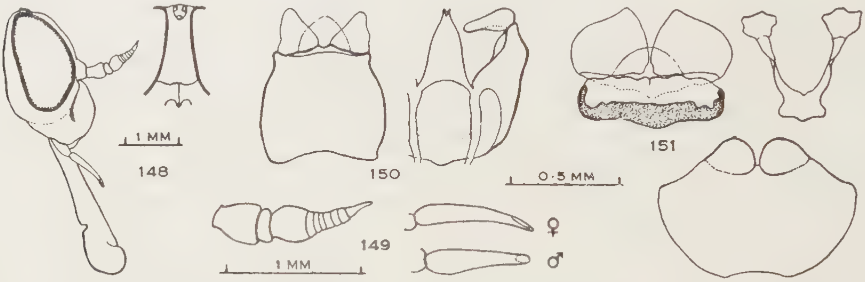
Figs. 140–147.—Subgenus *Pseudoscione*, female genitalia. 140, *rufonigra* (Ferg.); 141, *subcontigua* (Ferg.); 142, *lasiophthalma* (Macq.); 143, *quadrimacula* (Walk.); 144, *concolor* (Walk.); 145, *neoconcolor*, sp. nov.; 146, *aureohirta* (Ric.); 147, *roei* (Macl.).

Female (Figs. 148, 149, 151)

Head.—Eyes with long, dark brown hairs, relatively sparse on lower facets. Frons diverging to antennae (Fig. 148), brown, with long black hairs; ocellar tubercle brown. Subcallus greyish brown, without hairs; parafacials and face creamy grey, both with long mixed black and white hairs; central area of face without hairs.

Antennae: 1st and 2nd segments covered with creamy grey tomentum, and with long black hairs; 3rd creamy grey at extreme base, lighter brown on ventral part of 1st annulus, becoming blackish brown distally. Palpi (Fig. 149) very slender, creamy grey, with a small, oval, depressed, brownish area on distal half, and with long white and some black hairs. Proboscis short, labella large. Beard greyish white.

Thorax.—Scutum and scutellum dull dark brown, with indications of paler brown dorsocentral lines anteriorly and at suture, and lighter brown anterior margin and lateral areas; disc covered with a mixture of short, appressed, creamy hairs and longer, more erect, dark ones; notopleural hairs mixed black and greyish cream; supra- and postalar tufts and marginal scutellar hairs long, dull greyish cream. Pleura grey, with greyish white hairs, a few darker ones on upper mesopleural convexity, and a dense, creamy white tuft below wing root.



Figs. 148–151.—*Scaptia* (?*Pseudoscione*) *anomala*, sp. nov. 148, profile and frons of ♀; 149, antenna and palp of ♀, palp of ♂; 150, ♂ genitalia; 151, ♀ genitalia.

Legs.—Femora with pale grey tomentum overlying a dark brown ground colour, and with greyish white hairs; tibiae and tarsi light brown, darkening to blackish brown on apical tarsal segments, with black hairs, which are somewhat bristly on tibiae.

Wings.—Greyish, with faint brownish staining in costal cell and basally. Veins brown; R_4 gently curved, without appendix; cell R_5 widely open.

Abdomen.—Brownish black, with long black hairs; apical margins of tergites creamy brown, with a fringe of rather dense, creamy hairs, which widen to form indefinite median triangles on 1st to 5th tergites; marginal creamy hairs longer, but not especially dense. Venter grey, apical margins of sternites pale creamy grey; hairs silvery. Genitalia (Fig. 151) with small, rounded gonopophyses, unchitinized 10th tergite, truncate cerci, lateral arms of the furca rather large, and caudal ends of the spermathecal ducts long, lightly chitinized.

Male (Figs. 149, 150)

Similar to ♀, but more hairy. Face somewhat darker, with darker hairs; beard rather creamy yellow. Palpi similar to ♀, but the brown bare area distally is smaller. Pale hairs on scutum and abdominal tergites golden in Victorian specimens, similar to ♀ in allotype. Femora black, with less overlay of pale grey tomentum. Genitalia normal.

Distribution.—AUSTRALIAN CAPITAL TERRITORY: Mt. Gingera, Jan., Paramonov. VICTORIA: Mt. Donna Buang, Feb., Burns; near Warburton, 4000 ft, Jan., Wilson.

There is no information on habits.

SCAPTIA (PSEUDOSCIONE) IANTHINA (White)

**Diatomineura ianthina* White, 1915, p. 19; Taylor 1919, p. 43; Surcouf 1921, p. 130. Type ♀, from Bagdad Valley, Mangalore, Tas., 26.i.1912, A. White, in the British Museum (Natural History).

Scaptia ianthina (White). Enderlein 1925 p. 278 (misspelt *janthina*); Ferguson 1926*a*, p. 295.

Material examined.—1 ♀.

The type remains unique. I have seen no other specimen among 277 *Scaptia* from Tasmania, so it is apparently a rare species, but there is no reason to doubt the correctness of the locality. It is a dark insect, with a strong superficial resemblance to *clavata*, but differing in shape of frons and palpi, and in the flatter, more hairy abdomen, with distinct apical band of greyish cream hairs on 2nd tergite, and strongly depressed terminal segments. Length 14 mm.

This species is difficult to place. The frons is almost parallel, but the proboscis is long, and the palpi are short and remarkably slender. Structurally, it is more like *S.* (*Ps.*) *adrel* (Walk.) from New Zealand than any of the Australian groups.

Female

Head.—Eyes with long, brown hairs above, greyish below. Frons nearly parallel, index about 3, discoloured (blackish), but with black hairs and remains of brownish fawn tomentum; ocellar tubercle black. Subcallus with remains of greyish tomentum; parafacials bulging slightly forward, and face more protuberant than is usual in Australian species; both grey, with long, greyish white and black hairs. *Antennae*: 1st and 2nd segments dark brown, with black hairs; 3rd missing (described by White as black). Palpi dark brown, very slender; 1st segment cylindrical, nearly as long as 2nd, with black hairs above and greyish white below; 2nd narrow, somewhat flattened, rotated with lateral side up (as in New Zealand species), with long, somewhat hollow, bare area, and short, black, marginal hairs. Proboscis slender, black, about one and one-third times head height, with small, firm labella. Beard dense, rather dirty greyish white.

Thorax.—Scutum and scutellum dark greyish brown, more definitely greyish on lateral margins, with narrow, light greyish median line ending at suture, and slightly wider, light greyish dorsocentral lines, which widen and disappear between the grey suture and the posterior margin; median prescutellar area diffusely greyish; hairs black, except for greyish white tufts on humeral lobes and in an almost continuous zone from wing roots round scutellar margin. Pleura grey, with long, dense, greyish to creamy white hairs, mixed with a few black ones on upper mesopleural convexity.

Legs.—Dark brown, fore and mid tibiae and tarsi lighter than other segments; hairs predominantly black.

Wings.—Greyish, with clearer discal cell, feebly pigmented stigma, and dark brown veins; R_4 curved on one wing, obtusely angulate and with trace of appendix on other; cell R_5 narrowed to about one-third at margin.

Abdomen.—Wide and flat; dark brown, with 1st and 2nd tergites and apices of remainder somewhat lighter; hairs black, except for greyish white, median apical and posterolateral triangular tufts on all tergites; the median tuft small on 1st, the lateral joined to the median on 2nd by a narrow zone of yellowish cream hairs, and extending in on 4th almost to form a narrow, greyish white apical band. Venter brown, with predominantly black hairs in median zone, and with white, lateral, apical, triangular fringes extending medially on all sternites. Genitalia dorsoventrally compressed (not dissected).

Distribution.—TASMANIA: Bagdad Valley, on blossoms of a flowering shrub, Jan., White.

VI. Subgenus MYIOSCAPTIA Mackerras

Myioscaptia Mackerras, 1955*a*, p. 496. Type species *Pangonia violacea* Macquart, 1850, Australia, by original designation.

Female

Small (8–11 mm), rotund, muscoid-like species. Frons parallel or slightly diverging. Face moderately bulging. Proboscis less than one and a quarter times head height, usually slender, with small, firm labella, which are more extensively chitinized than in subgenus *Scaptia*. Palpi very short, flattened, usually broadly leaf-like in lateral view. Wings clear with prominent stigma; cell R_5 narrowed, or closed and short-petiolate; cell M_3 open. Eighth sternite with gonopophyses rounded; cerci rounded apically; lateral arms of furca relatively large, narrowly fused with lateral edge of 9th tergite.

Male

Palpi slender, as in subgenus *Scaptia*. Hypopygium with aedeagus unusually long; coxites normal; style hooked and pointed at tip, but not unusually wide, and without strong hairs.

Of the 7 known species, 4 are dark, metallic to semi-metallic, and extraordinarily like some Australian species of *Lucilia* and *Calliphora*; one is also dark, but has a banded abdomen, and resembles *S.* (*S.*) *minuscula* superficially; and the other two are paler and more tomentose, but still muscoid-like in appearance. The habitus is so distinctive that there should be little difficulty in placing any members of the subgenus.

KEY TO SPECIES OF THE SUBGENUS MYIOSCAPTIA

Females

1. Dark, green to purplish or blackish species, with abdominal tergites metallic or semi-metallic, and usually a strong resemblance to certain blowflies 2
   Light grey to yellowish brown species, with at most apical tergites of abdomen shining .. 6
2. Thorax and abdomen, including venter, bright metallic green to dark purplish blue .... *violacea*(Macq.)
   Scutum more or less covered with tomentum; abdomen usually darker and duller, venter not metallic 3

3. A black species; beard and pleural hairs greyish cream to black; abdominal tergites with apical bands of ashy hairs; legs brownish black. North Queensland .... *nigrocincta*, sp. nov.
   Beard and pleural hairs creamy to deep gold; abdomen purplish blue to bronzy green or greenish black, with golden hairs, which are densest towards apex 4
4. Cell R_5 open, or at most closed near wing margin without well-defined petiole; vein R_4 with at most rudimentary appendix; palpi and legs bright yellowish brown .... *bancrofti* (Aust.)
   Cell R_5 closed, with well-defined petiole; vein R_4 with strong appendix; palpi and legs brown to dark brown 5
5. Palpi bright brown, almost flat laterally; 3rd segment of antenna uniformly reddish brown. Western Australia .... *gibbula* (Walk.)
   Palpi darker brown, concave laterally, 3rd segment of antenna reddish brown basally, with terminal 3 annuli brownish black, contrasting. Eastern Australia .... *calliphora*, sp. nov.
6. A uniformly light grey species; scutum and abdomen more or less covered with yellowish cream hair .... *muscula* Eng.
   A yellowish brown species; scutum and anterior half of abdomen more or less covered with tomentum and dull golden hairs; posterior half of abdomen shining dark brown to black .... *nigroapicalis*, sp. nov.

SCAPTIA (MYIOSCAPTIA) VIOLACEA (Macquart)

**Pangonia violacea* Macquart, 1850, p. 22. Type ♀, from "Tasmanie" (erroneous), in the Paris Museum. Ricardo (1915*b*) designated an allotype ♂, from Herberton, N. Qld., in the German Entomological Museum, Berlin.

Diatomineura violacea (Macquart). Ricardo 1900*a*, p. 113, 1915*b*, p. 30; White 1915, p. 22; Taylor 1917*a*, p. 748; Ferguson 1921*a*, p. 367; Surcouf 1921, p. 131; Ferguson and Hill 1922, p. 248; Hardy 1929, p. 62.

Scaptia violacea (Macquart). Enderlein 1925, p. 278; Ferguson 1926*a*, p. 297, fig. 8; Hardy 1940, p. 485.

Scaptia (*Myioscaptia*) *violacea* (Macquart). Mackerras 1955*b*, p. 496, fig. 30.

Material examined.—2 ♂♂, 89 ♀♀.

A small, *Lucilia*-like, metallic green or purple-blue species, with flat, yellow-brown palpi, black legs, and shining metallic venter; vein R_4 without appendix; cell R_5 narrowed, but usually not closed. Length 8–9 mm.

Female (Figs. 33, 152, 160; Plate 3, Figs. 20, 21)

Head.—Eyes uniformly brown in life; with dark brown hairs above, more golden brown below. Frons covered with ashy tomentum, through which the blackish cuticle may show irregularly, and with black hairs; lower part protuberant, but without callus; ocellar tubercle ashy, not contrasting. Subcallus greyish fawn, lighter around antennae; parafacials with brown and grey reflections and inconspicuous brown hairs; face dark brown, with greyish reflections, and with black hairs. *Antennae*: 1st segment covered with ashy tomentum, 2nd more brownish, hairs on both black; 3rd short and relatively thick, reddish to yellowish brown, sometimes darkening apically. Palpi with 1st segment dark greyish brown, with black hairs; 2nd broad, flat, leaf-like, brownish yellow, with inconspicuous marginal black hairs. Beard golden brown, mixed with some black.

Thorax.—Scutum and scutellum shining metallic green, blue-green, or purplish blue, with a faint grey overlay, and grey dorsocentral lines and lateral areas which are quite conspicuous in certain lights; hairs on disc black; notopleural hairs black; supra- and postalar tufts variably mixed golden brown and black; marginal scutellar hairs all dark brown to black. Pleura dark grey, not metallic; all pleural hairs black, except the propleural, upper mesopleural, and hypopleural tufts, which may be black or golden brown, and the squamal tuft, which varies from black to creamy white.

Legs.—Entirely black, except for the pale knees.

Wings.—Slightly greyish to brownish; stigma variable, often dark brown and conspicuous, but sometimes barely visible; veins brown; R_4 without appendix; cell R_5 narrowed, sometimes closed at wing margin.

Abdomen.—First tergite with dark grey dusting, black hairs on disc, and a sublateral and marginal dull to deep golden fringe; remaining tergites bright metallic green to purple-blue, with black hairs. Venter metallic green to purple, with black hairs.

Male (Figs. 33, 43, 152)

Similar to ♀, but more hairy. Upper facets of eyes not enlarged. Hairs all black. Cell R_5 only slightly narrowed. Palpi rod-like, yellowish brown, apical bare area paler; hairs long and dense, black.

In general, northern specimens tend to be more purple-blue and southern ones more definitely green, as Ferguson and Hill (1922) noted, but there is considerable overlap.

Distribution.—QUEENSLAND: Kuranda, Dodd; Cairns, Dec., Norris; Meringa, Nov., Burns, Goldfinch, Taylor; The Boulders, near Babinda, Oct., M. & M.; Palm I., Dec., Bancroft, Hill, M. & M.; Little Crystal Ck., Mt. Spec, biting, Nov., Dec., M.J.M.; Eungella, Goldfinch; Rockhampton; Kilcoy, Oct.; Woodford, Nov.; Mt. Nebo, Oct., I.M.M.; Toowoomba, Dec., Greaves; Mt. Tamborine, Sept., Davidson, Deane, Froggatt; Cunningham's Gap, biting, Jan., M.J.M.; Springbrook, Dec., M. & M.; Binna Burra, biting, Nov.–Dec., M. & M.; National Park, Nov., Dec., Hacker, M. & M.; McPherson Range, Dec.; Mt. Lindsay, Dec., M.J.M. NEW SOUTH WALES: Tweed R., Oct., Froggatt; George's Ck., Macleay R., biting, Dec., I.M.M.; Comboyne, Dec., Pfeiffer; Kundibakh, Dennes.

SCAPTIA (MYIOSCAPTIA) BANCROFTI (Austen)

**Erephopsis bancrofti* Austen, 1912, p. 2; Taylor 1917*a*, p. 746; Ferguson 1920, p. 131; Surcouf 1921, p. 119. Probably also Taylor 1917*b*, p. 515; Ferguson and Henry 1920, p. 836 (both as var. of *gibbula* Walker). Type ♀, from Upper Burnett district, S. Qld., Bancroft, in the British Museum (Natural History).

Scaptia bancrofti (Austen). Ferguson 1926*a*, p. 297.

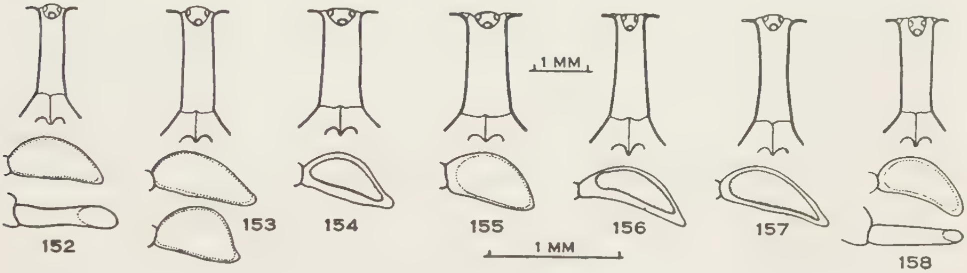
Scaptia (*Myioscaptia*) *bancrofti* (Austen). Mackerras 1955*a*, p. 496.

Material examined.—1 ♂, 54 ♀♀.

A rotund, *Calliphora*-like, variable species, usually resembling *C. stygia* (Fabr.), but sometimes more like *C. augur* (Fabr.) or *C. nociva* Hardy. Closely related to *calliphora* and *gibbula*, but distinguished by its flat, yellowish palpi, yellowish legs, usual absence of an appendix on R_4, and open cell R_5. Length 8–10 mm. The southern form will be described first.

Female (Figs. 153, 161; Plate 3, Fig. 22; Plate 4, Fig. 36)

Head.—Eyes with brown hairs, more yellowish below. Frons relatively narrow (index 3·5), grey with ashy reflections, darker below, with blackish hairs; ocellar tubercle grey. Subcallus yellowish fawn, cream round antennae and at sides; parafacials variably yellowish to greyish fawn, with yellow hairs; face brown, with thin creamy tomentose overlay, and mainly black hairs. *Antennae*: 1st segment light brown, with cream tomentum, 2nd brown, both with black hairs; 3rd reddish to orange-brown at base, variably darkening apically, but not as strongly contrasting as in *calliphora*. *Palpi*: 1st segment light brown, with light yellow hairs; 2nd bright creamy yellow, with very shallow concavity, and short black marginal hairs. Beard rich golden.



Figs. 152–158.—Subgenus *Myioscaptia*, mostly females. 152, *violacea* (Macq.), including palp of ♂; 153, *bancrofti* (Aust.), showing variation in palpi; 154, *calliphora*, sp. nov.; 155, *gibbula* (Walk.); 156, *nigrocincta*, sp. nov.; 157, *nigroapicalis*, sp. nov.; 158, *muscula* Eng., including palp of ♂.

Thorax.—Scutum and scutellum somewhat shining, dark slate blue to greyish, with indications of pale grey dorsocentral lines, especially in front of suture, and grey lateral margins; hairs on disc and notopleural lobes black, dull gold above and behind wing root, and black on edge of scutellum. Pleura dark grey, with a vague brownish tint; pronotal, upper mesopleural, hypopleural, and squamal tufts deep gold, some black hairs on upper mesopleural convexity, and fine creamy gold elsewhere.

Legs.—Coxae brownish grey, with creamy gold hairs; femora bright yellow, with yellow hairs, and some black ones on fore pair; remaining segments more brownish, with predominantly black hairs.

Wings.—Somewhat greyish, faintly darkened towards base of costal cell; stigma brown; veins somewhat darker brown; R_4 usually sinuous, sometimes obtusely angulate and with trace of appendix; cell R_5 narrowed, but only occasionally closed on margin of wing.

Abdomen.—Shining, semi-metallic, dark green to rich purple; hairs predominantly golden, sparse, and sometimes mixed with black on basal tergites, long and denser apically, accentuating the resemblance to *C. stygia*. Venter duller greenish to brownish black, with dull golden hairs, which are densest laterally.

The type and some other specimens from Eidsvold and north Queensland have the 3rd antennal segment darkened only at extreme tip, the palpi longer and not so wide, the abdominal tergites more bluish, and with apical semi-metallic bronzy bands, and the sternites more definitely brown. Austen had both forms before him when he described the species, the differences in appearance are due merely to minor alterations in pattern, and I do not think that the southern form should be given a separate name.

Male

The only ♂ seen is the most southerly specimen known, and is allotted to this species with reservation, because it is almost as dark as *calliphora*, and has a somewhat similar 3rd antennal segment, but the legs and venation are like those of *bancrofti*. Eyes with upper facets not enlarged; hairs rich brown above, creamy yellow below; parafacials with long, dark brown hairs; 3rd antennal segment dark brown at base, yellowish on apical half of 1st and all of 2nd to 4th annuli, blackish brown on apical 4; palpi dark brown, rod-like, with paler apical lateral bare area, and mixed black and golden hairs.

Distribution.—QUEENSLAND: Millaa Millaa, Dec., McCabe; Gladstone, Nov., Poggioli; Eidsvold, Mar., Bancroft; Mt. Tamborine, Sept., Davidson, Froggatt; Binna Burra, biting, Nov., M. & M. NEW SOUTH WALES: Dorrigo, Nov.–Dec., Wright; Meldrum, Nov., Raven; Pt. Lookout, near Ebor, Dec., M. & M.; Scott's Head, "biting cattle", Oct., Mackenzie; Comboyne, Oct., Stennett; Kendall, Oct.; Wingham, Nov., Pfeiffer; Taree, Oct.; Kundibakh, Dennes; Ourimbah State Forest, Nov., Campbell; Gosford, Oct.; Norton's Basin, Nepean R., Nov., Clark, Musgrave; Sydney (Auburn), May (British Museum); Burragorang, Oct., Fitzpatrick; Mt. Keira, Dec., Chadwick; Wandandian, Nov.; Jervis Bay, Oct., Paramonov (♂).

SCAPTIA (MYIOSCAPTIA) CALLIPHORA, sp. nov.

Types.—Holotype ♀, from Woy Woy, N.S.W., 4.x.1925, A. J. Nicholson, and allotype ♂ from Mt. Kembla, N.S.W., without further data, in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—1 ♂, 15 ♀♀.

A darker species than *bancrofti*, and consequently more like *C. tibialis* Macq. than *C. stygia*. Further distinguished by: wider frons; sharply defined, strongly contrasting, black apical 3 annuli of 3rd antennal segment; darker, concave palpi; dark to blackish brown legs; strong appendix to R_4, and closed, petiolate cell R_5. Length 9–10 mm.

Female (Figs. 154, 163; Plate 4, Fig. 37)

Head.—Eyes with dark brown hairs above, paler below. Frons relatively wide (index 2·5), dark greyish brown, fawn-grey along eye margins, with long dark brown and some creamy yellow hairs; ocellar tubercle dark grey. Subcallus with dark grey tomentum, showing paler reflections; parafacials grey, with dull yellowish cream hairs; face dark grey, with dark brown hairs. *Antennae*: 1st segment with dark grey tomentum and black hairs; 2nd dark brown, with black hairs; basal half of 3rd bright orange to reddish brown, apical three and a half annuli black. *Palpi*: 1st segment blackish, with dull yellowish cream hairs; 2nd brown, with well-marked paler brown to yellowish fawn concavity, and short black hairs. Beard dull yellowish.

Thorax.—Scutum and scutellum blackish, with thin grey tomentum, and indications of paler median and dorsocentral lines; hairs on disc mixed fine erect black and stronger, more appressed dull yellowish cream, especially behind the head and in front of scutellum; notopleural hairs mixed black and dull yellow; supra- and postalar tufts more brownish yellow. Pleura grey, with dense, long, dull golden hairs, and some sparser black ones on upper part of mesopleural convexity.

Legs.—Coxae dark grey, with dull creamy yellow hairs; femora blackish brown, with dull gold and a few black hairs; remaining segments brown, darkening apically on tarsi, and with predominantly black hairs.

Wings.—Greyish, with a trace of brown in cell *sc* and at apices of basal cells; stigma dark brown, conspicuous; veins bright brown; R_4 with strong appendix; cell R_5 closed, petiolate (Plate 4, Fig. 37); cell M_3 narrowed, closed in one specimen.

Abdomen.—Semi-metallic blackish brown, with a very thin greyish overlay; hairs rich dark golden, fairly strong on the 1st segment, sparse and mixed with inconspicuous black hairs in the middle of the 2nd to the 4th, and denser on the 5th and apical segments. Venter similar to dorsum.

Male

Similar to ♀, and distinguished from the ♂ of *bancrofti* by having well-developed appendix on vein R_4, closed cell R_5, darker legs, and possibly by a somewhat shorter aedeagus.

Distribution.—NEW SOUTH WALES: Woy Woy, Oct., I.M.M., Nicholson; Sydney (Narrabeen, French's Forest, Roseville), biting, Sept., Oct., Chadwick, Plomley, Wassell, Wirth; Heathcote, Sept., Henry; National Park, Sept., I.M.M.; Picton Lakes, Sept., Oct., Fuller, Lee; Austinmer, Sept., Froggatt; Mt. Flora, Colo Vale, biting, Nov., Dyce.

SCAPTIA (MYIOSCAPTIA) GIBBULA (Walker)

**Pangonia gibbula* Walker, 1848, p. 140. Type ♂, from Western Australia, in the British Museum (Natural History).

Erephopsis gibbula (Walker). Ricardo 1900*a*, pp. 112, 117, 1917, p. 210; Taylor 1918, p. 56; Ferguson 1921*a*, p. 367; Surcouf 1921, p. 119. Not Ricardo 1915*b*, p. 22 (= *S.* (*Plinthina*) *vertebrata* (Bigot)); Taylor 1917*b*, p. 515 (probably = *bancrofti* Austen); Ferguson and Henry 1920, p. 836 (probably = *bancrofti* Austen).

Lilaea gibbula (Walker). Enderlein 1925, p. 297.

Scaptia gibbula (Walker). Ferguson 1926*a*, p. 297.

Scaptia (*Plinthina*) *gibbula* (Walker). Mackerras 1955*a*, p. 496.

Material examined.—3 ♂♂, 2 ♀♀.

Close to *calliphora*, which may be no more than a subspecies. However, there are differences in genitalia, and it seems best to treat the two forms as distinct. It may be sufficiently characterized by comparison with the eastern form.

Female (Figs. 155, 162)

Frons more divergent than in *calliphora*, paler, and with entirely dark hairs; parafacials more ashy; antennae paler, more like those of *bancrofti*, with apical annuli of 3rd segment only slightly darkened; palpi flatter, more uniformly brown. Legs with femora dark brown, distinctly paler on apical fourth; remaining segments light yellow-brown, darkening apically on tarsi. Abdomen without black hairs among the dull golden on discs of first 3 tergites; furca longer and caudal ends of spermathecal ducts shorter than in *calliphora.*

Male

Larger than ♂ of *bancrofti* (10–11 mm). Eyes with upper facets not enlarged, and a sharp division between the upper dark brown hairs and the lower creamy yellow ones; parafacials darker than in ♀, palpi dark brown, rod-like, apical bare area paler, hairs black and creamy gold. Front of thorax surrounded by the golden beard and fore coxal hairs. Legs paler than in ♀, with more numerous black hairs ventrally on femora. Wings with cell R_5 shorter petiolate than in ♀. Abdomen hairier than in ♀, discs of 2nd to 4th tergites with long, black hairs, the gold being reduced to apical fringes, which may be incomplete on 2nd tergite.

Distribution.—WESTERN AUSTRALIA: Cape Mentelle, Oct., Common; Warren R., W. D. Dodd.

SCAPTIA (MYIOSCAPTIA) NIGROCINCTA, sp. nov.

Type.—Holotype ♀, from Magnetic I., N. Qld., –.i.1920, F. H. Taylor, in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—6 ♀♀.

A small, muscoid-like species, with dark grey thorax, dark brown legs, slightly grey wings, and semi-metallic, black abdomen, banded with white hairs. Length 9–10 mm.

Female (Figs. 156, 159)

Head.—Eyes with short, brown hairs centrally, paler below. Frons pale fawn-grey, with black hairs; ocellar tubercle grey. Subcallus fawn-brown, with paler reflections; parafacials darker, with some black hairs at lower margin; face brown, with short, dark brown hairs on each side below antennae. *Antennae*: 1st and 2nd segments light creamy brown, with black hairs; 3rd brownish yellow, darkening apically. Palpi brown; 1st segment with longer, black hairs; 2nd with distinct orange-brown concavity and very short black hairs at margins. Beard brown.

Thorax.—Scutum and scutellum dark grey, rather shiny, with paler grey median and dorsocentral lines and lateral margins; hairs all black, except postalar tuft, which is yellowish cream, and some cream hairs in front of scutellum. Pleura brownish grey; hairs dark brown, except for dull cream propleural and hypopleural tufts, and creamy white squamal tuft.

Legs.—Entirely brown, the femora darker than the tibiae; knees pale; hairs dark brown, except for pale ventral zone on fore tibiae and tarsi.

Wings.—Faintly greyish; cell *sc* brownish; stigma brown; veins brown; R_4 with short appendix; cell R_5 narrowed.

Abdomen.—Shining metallic blue-black, with black hairs over most of tergites, and fairly broad, but variable, apical bands of greyish white hairs on the 1st to the 3rd or 4th, giving the abdomen a banded appearance; marginal hairs black, except where the creamy apical bands expand somewhat laterally. Venter blue-black;

hairs greyish white on the 2nd sternite, dark brown, contrasting, on subsequent sternites.

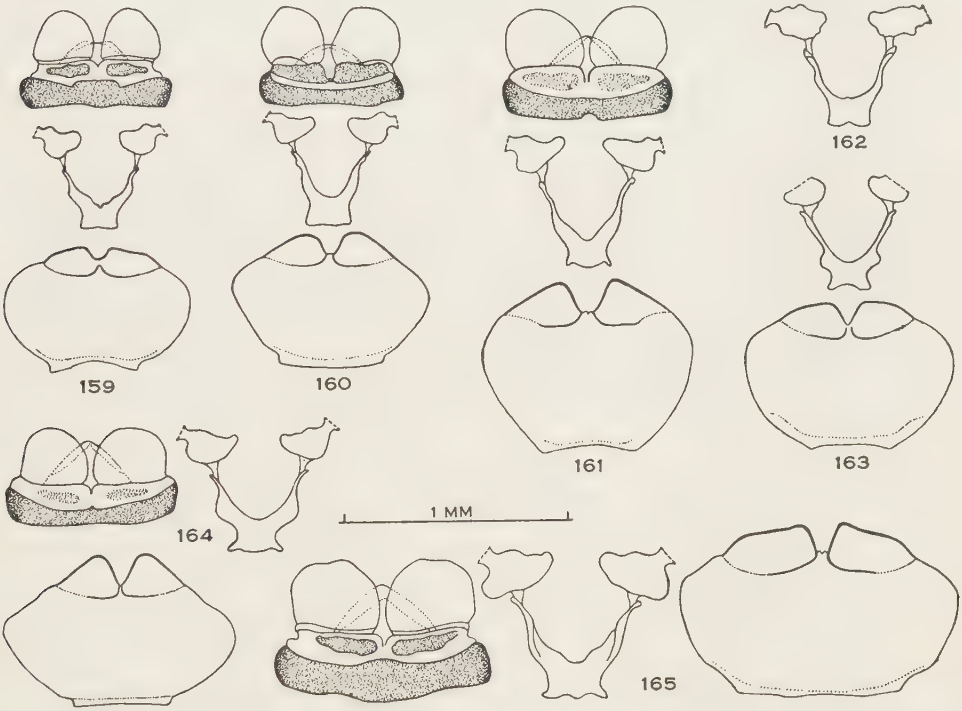
Distribution.—QUEENSLAND: Magnetic I., Jan., Taylor.

SCAPTIA (MYIOSCAPTIA) NIGROAPICALIS, sp. nov.

Types.—Holotype ♀, from Wentworth Falls, N.S.W., 11.xii.1926, I. M. Mackerras, and allotype ♂, from Sydney, 13.x.1923, E. W. Ferguson, in the School of Public Health and Tropical Medicine, University of Sydney.

Material examined.—1 ♂, 2 ♀♀.

A thick-set, fawn-brown species, with light brown legs, clear wings with a prominent dark stigma, and apical half of abdomen shining black. Length 9–10 mm.



Figs. 159–165.—Subgenus *Myioscaptia*, female genitalia. 159, *nigrocincta*, sp. nov.; 160, *violacea* Macq.); 161, *bancrofti* (Aust.); 162, *gibbula* (Walk.), furca only; 163, *calliphora*, sp. nov.; 164, *nigroapicalis*, sp. nov.; 165, *muscula* Eng.

Female (Figs. 157, 164)

Head.—Eyes with fawn hairs, somewhat paler below. Frons greyish to yellowish fawn, with dark brown hairs; ocellar tubercle grey. Subcallus creamy fawn; parafacials similar, hairless; face similar, more brown in centre, and with brown and a few creamy hairs on each side. *Antennae*: 1st and 2nd segments covered with brownish cream tomentum and fairly long, dark brown hairs; 3rd orange-yellow, not darkened apically. Palpi creamy yellow, with dark brown hairs; bare area brownish yellow, slightly concave. Beard creamy yellow, with some dark brown hairs anteriorly.

Thorax.—Scutum and scutellum uniformly olive brown, with greyish overlay, and a dense covering of dull yellowish cream and some black hairs; notopleural group, supra-alar tuft, postalar tuft, and marginal scutellar hairs creamy yellow, with a variable mixture of black hairs. Pleura grey, with yellowish to brownish cream hairs, mixed with some black ones on the upper mesopleural convexity.

Legs.—Brownish yellow, hind pair slightly darker than others; hairs predominantly creamy yellow on femora, brown anteriorly, creamy yellow posteriorly on tibiae and tarsi.

Wings.—Clear; stigma dark brown, conspicuous; veins brownish yellow; R_4 sinuous, with a rudimentary appendix on one wing; cell R_5 closed.

Abdomen.—First and 2nd tergites covered with dark greyish brown tomentum and dense yellowish cream hairs, which make the basal half light in colour; apical tergites shining black, with black hairs. Venter with basal 2 sternites grey, with yellowish cream hairs; remainder black, like tergites.

Male

Upper facets of eyes not enlarged; hairs very dense, with a distinctive golden hue. Dense light brown hairs on parafacials. Palpi fawn, rod-like, with small apical lateral bare area, and long brown and some creamy yellow hairs. Wings with cell R_5 widely open. Apical segments of abdomen shining deep brown rather than black, and hypopygium light yellowish brown.

Distribution.—NEW SOUTH WALES: Wentworth Falls, Dec., I.M.M.; Sydney, Oct., Ferguson; Heathcote, Oct., Henry.

SCAPTIA (MYIOSCAPTIA) MUSCULA English

**Scaptia muscula* English, 1955, p. 223, text-figs. 15–34. Holotype ♀ and allotype ♂, reared from larvae collected within 60 miles of Sydney, in the Macleay Museum, University of Sydney.

Scaptia (*Myioscaptia*) *muscula* English. Mackerras 1955*a*, p. 496.

Material examined.—5 ♂♂, 1 ♀.

A striking, pale grey species, with fawn-yellow legs, and greyish wings, with well-marked stigma. Length 9–11 mm.

Female (Figs. 158, 165)

Head.—Eyes with brownish cream hairs above, paler below. Frons pale fawn, greyish in centre, and with cream hairs above, brown below; ocellar tubercle grey. Subcallus pale grey, almost ashy; parafacials similar, with some long creamy hairs below; face a little darker, and with long creamy hairs and a few darker ones laterally. *Antennae*: 1st and 2nd segments pale yellowish fawn, with brown and cream hairs; 3rd orange-yellow. *Palpi*: 1st segment grey, with cream hairs; 2nd light brown, with almost flat, orange-yellow bare area, and inconspicuous cream marginal hairs. Beard creamy white.

Thorax.—Scutum and scutellum grey, with indications of pale grey median and dorsocentral lines in front of the inconspicuous suture; hairs long, cream to yellowish cream, particularly dense on anterior part of disc, lateral margins, and in front of scutellum. Pleura pale grey; hairs cream, fairly dense.

Legs.—Light fawn-yellow, with some darkening basally on femora and on hind tarsi; hairs predominantly cream on femora, mixed black and brown posteriorly on hind tibiae, and black elsewhere.

Wings.—Faintly grey; basicosta dark brown; stigma dark brown, conspicuous; veins fawn-cream, darker distally; R_4 with appendix on one side, not on the other; cell R_5 narrowed.

Abdomen.—Uniformly grey, a little paler than the scutum, and with dense yellowish cream hairs, which show some concentration at apices of tergites. Venter uniformly light grey, with cream hairs.

Male (Fig. 158)

Similar to ♀, but rather more hairy, and with a more yellowish tint in some of the upper mesopleural hairs. Upper facets of eyes not enlarged; hairs brown. Palpi light brown, rod-like, with small, yellow, apical bare area, and long cream hairs.

Distribution.—NEW SOUTH WALES: Woy Woy, Oct., Nicholson; Avalon, Oct., English; Woodford, Oct., English; Sydney (Turramurra, Roseville, Chatswood, Northbridge, Oatley), Oct., Nov., English, Graham; Appin, Oct., English.

Miss English knew of only the six captured adults listed above, but she collected considerable numbers of larvae and several pupae in sand on the floor of small caves and ledges in sandstone cliffs.

VII. Subgenus PLINTHINA Walker

Plinthina Walker, 1850, p. 10; Ferguson 1924, pp. 253, 256, 1926*a*, p. 299; Mackerras 1955*a*, p. 497. Originally monotypic for *Pangonia macroporum* Macquart, 1838 (= *Pangonia binotata* Latreille, 1812), Kangaroo I., S. Aust.

Female

Medium-sized (10–14 mm) species, of normal habitus and tomentose patterns, but with the wings usually distinctively marbled, the centres of the cells being darker than along the veins. Frons parallel or slightly diverging. Face moderately projecting, but truncate. Proboscis less than one and a quarter times the head height, moderately slender, with relatively small, firm labella. Palpi very short; 2nd segment little, if at all, longer than 1st, usually thick, rounded apically, and with a large lateral concavity. Wing with cell R_5 closed, and often long-petiolate; cell M_3 open. Eighth sternite often unusually wide, with rounded gonopophyses; cerci rounded apically; lateral arms of furca large, fused with lateral edge of 9th tergite. The two halves of the 10th tergite also tend to fuse with each other and with the 9th, evidently a further expression of a need for rigidity in these parts (Figs. 177, 179–181; see also *S.* (*M.*) *violacea*, Fig. 160).

Male

Palpi as in subgenus *Scaptia* or rather stouter. Hypopygium with aedeagus long; coxite thick and often ridged; style wide, strongly hooked and pointed at tip, and with a zone of conspicuous, short, thick hairs about middle.

All the species, except *vertebrata*, can be placed subgenerically by their distinctive wing pattern. They are also easy to identify, as their external characters are supported by better genitalic differences than are usually seen in the other subgenera. The only difficulty encountered was with old specimens of *binotata* and *divisa*, which had faded to a dull red colour, and seemed at first to be very different from the dark specimens that were collected later.

Key to Species of the Subgenus Plinthina

Females

1. Wings clear; a grey species, with reddish to dark brown markings; petiole of cell R_5 short; palpi very small. Eastern Australia ....*vertebrata* (Big.)
   Wings marbled; darker species 2
2. Petiole of cell R_5 long; palpi small (Figs. 169–171) 3
   Petiole of cell R_5 short; palpi relatively large (Figs. 166–168) 5
3. Palpi flatter, pointed, with shallow lateral concavity; a black species, with inconspicuous dorsocentral lines on scutum, and mesopleural hairs predominantly black. Western Australia ....*cinerea* (Ric.)
   Palpi thicker, blunter, with deeper lateral concavity; not such dark species, with prominent dorsocentral lines on scutum, and mesopleural hairs predominantly pale 4
4. Abdomen shining black, with black and ashy hairs. Western Australia ..*subcinerea*, sp. nov.
   Abdomen with 1st and 2nd tergites brown, remainder darker, often with indications of a median brown vitta and paler apical bands. Eastern and Western Australia.......... ....*clelandi* (Ferg.)
5. Palpi flatter, pointed; an entirely black species, with evanescent scutal vittae; beard largely black. Eastern Australia..................................*nigerrima*, sp. nov.
   Palpi thicker, blunter; not such dark species; scutal vittae well defined; beard white ..6
6. Frons white; scutum with sublateral ground colour dark, prominent, and dorsocentral lines pale, conspicuous; abdomen blackish. South and Western Australia ....*binotata* (Latr.)
   Frons brown; ground colour of scutum more uniform, and dorsocentral lines duller, less conspicuous; abdomen dark red-brown. Western Australia ....*divisa* (Walk.)

Scaptia (Plinthina) divisa (Walker)

**Pangonia divisa* Walker, 1850, p. 17. Type ♀, from Western Australia, in the British Museum (Natural History).

Erephopsis divisa (Walker). Ricardo 1900*a*, pp. 112, 117; Ferguson 1921*a*, p. 367; Surcouf 1921, p. 119.

Lilaea divisa (Walker). Enderlein 1925, p. 297.

Osca (*Plinthina*) *divisa* (Walker). Ferguson 1924, p. 256.

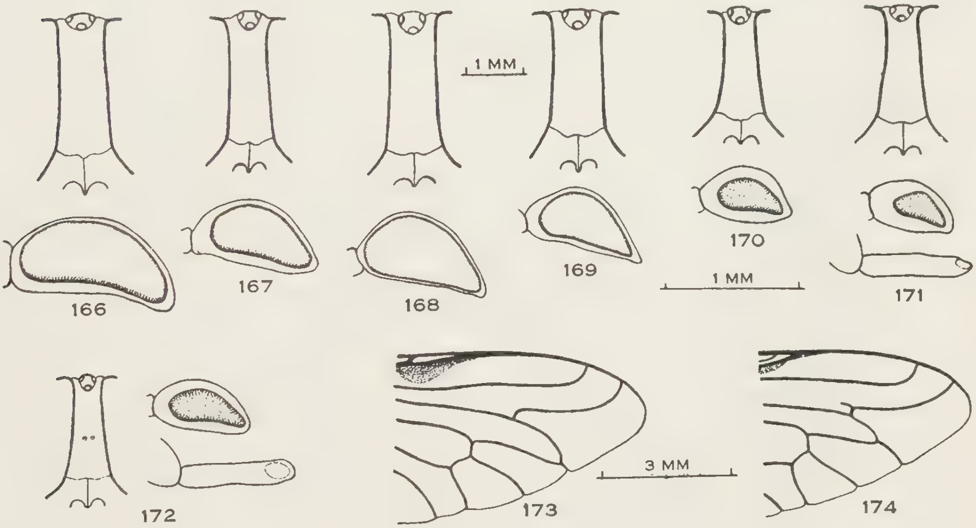
Scaptia (*Plinthina*) *divisa* (Walker). Ferguson 1926*a*, p. 298; Mackerras 1955*a*, p. 497.

Material examined.—9 ♀♀.

A dark brown species, with relatively large, thick palpi, and short petiole to cell R_5. Distinguished from *binotata* by its brown frons, narrow dorsocentral lines on scutum, and brown abdomen. Length 11–13 mm.

Female (Figs. 167, 176; Plate 3, Fig. 24)

Head.—Eyes with dense, dark brown hairs. Frons brown, with a darker brown patch near centre, and narrow, greyish fawn zone along eyes, widening somewhat at ocellar tubercle, which is slightly raised and more greyish; hairs dark brown, black on ocellar tubercle. Subcallus brown; parafacials and face darker brown, with dark brown hairs. *Antennae*: 1st and 2nd segments brown, with some greyish tomentum, and long black hairs; 3rd dark reddish brown on basal annulus, more orange-brown on remaining annuli, extreme tip black. *Palpi*: 1st segment brownish black, with black hairs; 2nd dark brown, paler round margins of extensive shallow bare area; marginal hairs short, black. Beard creamy white, with a few black hairs at lower margin of parafacials.



Figs. 166–174.—Subgenus *Plinthina*, mostly females. 166, *binotata* (Latr.); 167, *divisa* (Walk.); 168, *nigerrima*, sp. nov.; 169, *cinerea* (Ric.); 170, *subcinerea*, sp. nov.; 171, *clelandi* (Ferg.), including palp of ♂; 172, *vertebrata* (Big.), including palp of ♂; 173, wing of *binotata*, ♀; 174, wing of *clelandi*, ♀.

Thorax.—Scutum and scutellum with ground colour uniformly dark brown, sublateral areas relatively wide and not sharply differentiated from the more greyish lateral areas; median line, dorsocentral lines, and suture narrow, brownish grey, the dorsocentral lines wider and paler near anterior margin and at suture; hairs dark brown to black on most of disc, greyish white on pronotal lobes, above and behind the wing root, and in a median zone in front of the scutellum, black on notopleural lobes. Pleura brown to greyish, with black hairs on lower part of mesopleural area, mixed black and dull creamy white on upper mesopleural convexity, and dull creamy white elsewhere.

Legs.—Coxae dark brown, with predominantly black hairs; remaining segments deep to bright brown, with brownish cream knees; hairs black, except for a ventral zone of short, orange hairs on tibiae and tarsi.

Wings.—Brownish grey, with the pale edgings to the veins narrow, so that the marbling is inconspicuous; stigma brownish black; veins brown; R_4 strongly curved or angulate, with at most a short appendix; petiole to cell R_5 short to medium.

Abdomen.—Uniformly shining, rich to deep brown; tergites covered with black hairs, except for lateral zones of ashy white hairs which extend inwards a little way along their apical edges. Venter similar, irregularly darker and with black hairs in the median zone, with ashy white hairs in the sublateral and lateral zones, and along most of the apical edges of the first three sternites.

An old specimen in the Taylor Collection is almost uniformly chestnut brown, but is otherwise similar, and its appearance is evidently due to fading.

Distribution.—WESTERN AUSTRALIA: Mundaring, on cow, Clark; 8 miles NNW. of Kuringup, Nov., Calaby; 13 miles E. of Pingrup, Nov., Calaby.

SCAPTIA (PLINTHINA) BINOTATA (Latreille)

Pangonia binotata Latreille, 1812, p. 703; Surcouf 1921, p. 127 (as *Pangonius*). Type ♀, from New Holland, collection not stated.

Erephopsis binotata (Latreille). Ferguson 1921*a*, p. 366.

Osca (*Plinthina*) *binotata* (Latreille). Ferguson 1924, p. 256.

Scaptia (*Plinthina*) *binotata* (Latreille). Ferguson 1926*a*, p. 298; Mackerras 1955*a*, p. 497.

**Pangonia macroporum* Macquart, 1838, p. 101; Walker 1854, p. 143. Type ♀, from Kangaroo I., S.Aust., in the Paris Museum.

Erephopsis macroporum (Macquart). Ricardo 1900*a*, pp. 112, 117; Surcouf 1921, p. 120; Ferguson 1921*a*, p. 366 (syn. of *binotata* Latreille).

Plinthina macroporum (Macquart). Enderlein 1922, p. 341, 1925, p. 296.

Material examined.—30 ♀♀.

A deep reddish brown to blackish species, with relatively long palpi, and short petiole to vein R_5. Distinguished from *divisa* by its darker general colour, white frons, more conspicuous pale vittae and darker sublateral ground colour on scutum, and conspicuously marbled wings; from *subcinerea* by white frons, long palpi, and short petiole to cell R_5. Length 12–14 mm.

Female (Figs. 166, 173, 175; Plate 3, Fig. 23)

Head.—Eyes with dense, dark brown hairs. Frons uniformly greyish white, with dull yellowish hairs; ocellar tubercle greyish white, with black hairs. Subcallus brown above and lateral to antennae, greyish white in mid-line and at corners of eyes; parafacials and face dark brown, with dark brown hairs. *Antennae*: 1st and 2nd segments brown, with greyish tomentum and black hairs; 3rd deep brown, paler at extreme base. Palpi longer than in *divisa*, but with similar shallow concavity; dark brown, with black hairs, the 1st segment with some dull golden and white hairs below. Beard greyish white, with a small area of brown at lower margin of parafacials.

Thorax.—Scutum with well-defined grey median and dorsocentral lines, and the lateral areas broadly pale grey; submedian ground colour brown, becoming irregularly invaded by the grey behind the suture; sublateral ground colour deeper brown and continuous, except for an intrusion of grey at the suture; a small brown patch in the grey lateral area above the wing root. Hairs dark brown, some white ones across anterior margin and extending forward irregularly from the scutellum;

hairs on notopleural lobes mixed brown and dull gold; supra- and postalar tufts white, the latter conspicuous. Scutellum deep brown laterally, lighter brown with a greyish suffusion in median area; hairs black. Pleura brown, except for grey anterior half of upper mesopleural convexity; propleural, hypopleural, and squamal tufts white, a small patch of white below wing root, and mixed white and yellowish hairs on the grey part of upper mesopleural convexity; remaining mesopleural hairs dark brown, contrasting strongly with the white tufts in front of and behind them.

Legs.—Femora dark brown, almost blackish, knees light yellowish, remaining segments brown; hairs black, except for the orange ventral zone on tibiae and tarsi.

Wings.—Grey, conspicuously marbled; stigma brownish black; veins brown; R_4 with or without appendix; petiole of cell R_5 short.

Abdomen.—Shining, deep mahogany brown to blackish; hairs as in *divisa*, except for an extensive zone of white on each side of 1st tergite, and more complete apical white fringes to the basal sternites.

As with *divisa*, old specimens are considerably paler in general coloration, and have presumably faded.

Distribution.—SOUTH AUSTRALIA: Arno Bay, "frightens cows"; Kangaroo I. WESTERN AUSTRALIA: 50 miles SW. of Balladonia, Nov., Calaby; Juranda Rock, Dec., Calaby; Junana Rock, Dec., Calaby; Mt. Ragged, Dec., Calaby; Kulikup, Dec., Hart.

SCAPTIA (PLINTHINA) NIGERRIMA, sp. nov.

Type.—Holotype ♀, from Grafton, N.S.W., 11.xi.1947, from the collection of the New South Wales Department of Agriculture, but presented to the School of Public Health and Tropical Medicine for inclusion in the Ferguson Collection.

Material examined.—1 ♀.

An almost entirely black species, with relatively large, flat, pointed palpi, and petiole of cell R_5 short. Distinguished from all other members of the subgenus by its entirely blackish antennae, palpi, and legs, and darkly marbled wings. It seems out of place in eastern New South Wales, but there is no reason to doubt the locality. Length 12 mm.

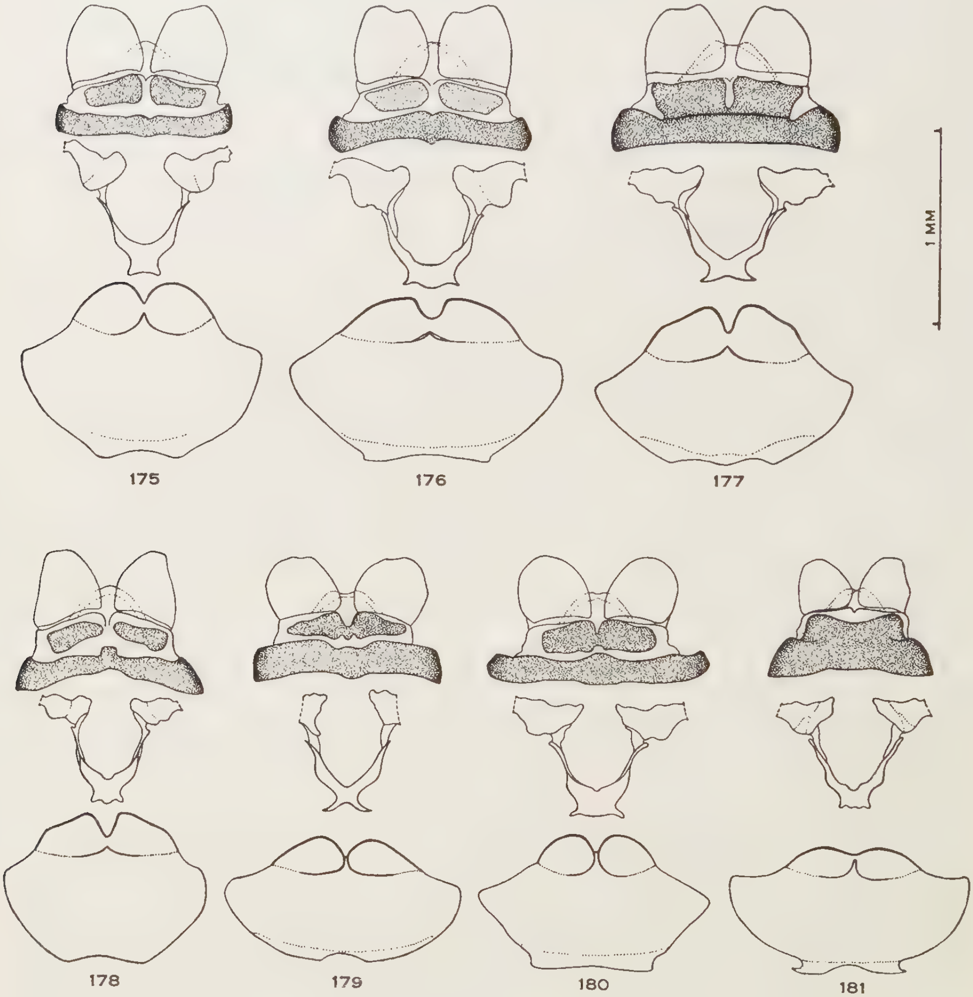
Female (Figs. 168, 178)

Head.—Eyes with black hairs, shorter below and on margins. Frons blackish brown, with black hairs, concentrated to form a velvety black marking about mid-length and another at the top of the frons, less dense elsewhere; ocellar tubercle blackish grey, surrounded by lighter grey tomentum, which extends some distance down eye margins. Subcallus, parafacials, and face deep brown, parafacials and face with black hairs. *Antennae*: 1st and 2nd segments black, with grey tomentum, and black hairs; 3rd brownish black. Palpi blackish brown, with black hairs. Beard black anteriorly, white posteriorly, where it mingles with the white propleural hairs.

Thorax.—Scutum black, with ill-defined, narrow, greyish dorsocentral lines; hairs entirely black, except for an admixture of white in the postalar tuft. Scutellum black, with a greyish overlay in the median area, and with black hairs. Pleura dark grey, with white propleural, hypopleural, and squamal tufts; most of mesopleural hairs black.

Legs.—Brownish black, with black hairs; knees light yellowish brown.

Wings.—Dark grey, marbled; stigma blackish; veins black to dark brown; R_4 angulate, without appendix; cell R_5 short-petiolate.



Figs. 175–181.—Subgenus *Plinthina*, female genitalia. 175, *binotata* (Latr.); 176, *divisa* (Walk.); 177, *cinerea* (Ric.); 178, *nigerrima*, sp. nov.; 179, *subcinerea*, sp. nov.; 180, *clelandi* (Ferg.); 181, *vertebrata* (Big.).

Abdomen.—Shining black, with mainly black hairs on disc, but some white ones sublaterally on tergites, as well as forming a white lateral fringe, and on most of sternites.

Distribution.—NEW SOUTH WALES: Grafton, Nov.

SCAPTIA (PLINTHINA) CINEREA (Ricardo)

**Erephopsis cinerea* Ricardo, 1915*b*, p. 26; Taylor 1918, p. 55; Surcouf 1921, p. 119. Type ♀, from Swan R., W.A., in the British Museum (Natural History). Taylor (1918) designated an allotype ♂, from King George Sound, in the Australian Museum.

Osca (*Plinthina*) *cinerea* (Ricardo). Ferguson 1924, p. 256.

Scaptia (*Plinthina*) *cinerea* (Ricardo). Ferguson 1926*a*, p. 298, fig. 11; Mackerras 1955*a*, p. 497. Ferguson illustrated this species correctly in his figure, although the specimens labelled "*cinerea*" in his collection were really *subcinerea*.

Material examined.—14 ♀♀.

A small to medium-sized, blackish species; with small, flat, pointed palpi; white beard and pleural hairs, except for black on the mesopleura; dark brown legs; dark, inconspicuously marbled wings, cell R_5 with long petiole; and shining black abdomen. Length 11–12 mm.

Female (Figs. 169, 177)

Head.—Eyes with dark brown hairs. Frons dark brown, with grey markings around ocelli and narrowly along the eye margins, and with deep brown hairs, which are somewhat concentrated on either side of a median bulge just below the mid-length. Subcallus, parafacials, and face dark brown, but narrowly grey at lateral edges of subcallus and irregularly on parafacials; parafacials and face with dark brown hairs. *Antennae*: 1st segment with grey and brown tomentum, and long black hairs; 2nd brown, with long black hairs; 3rd blackish brown. Palpi small, flatter than in relatives, tapering to a point, dark brown, with a shallow, almost black lateral concavity; hairs mixed brown and creamy white below on 1st segment, and short black marginally on 2nd. Beard white, with a few brown hairs anteriorly.

Thorax.—Scutum blackish brown, with grey median and dorsocentral lines, and grey lateral areas containing a brown fleck above the wing root. The grey colour tends to be confluent at anterior margin and in front of the scutellum, and is rather dark, so that the contrast with the ground colour is not striking. Hairs on disc black, mixed with, and more or less replaced by, greyish white anteriorly and just in front of scutellum; notopleural hairs mainly black; supra- and postalar tufts mainly white, conspicuously so just lateral to the scutellum. Scutellum dark brown laterally, continuing the submedian ground colour, and grey, continuing the median vitta, in the central area; hairs black. Pleura brown below and posteriorly, grey on upper mesopleural convexity; propleural hairs, some of the anterior ones on the mesopleural convexity, a small, dense tuft beneath wing root, and hypopleural and squamal tufts white, a fairly conspicuous brown tuft on posterior part of upper mesopleural convexity, and brown hairs below.

Legs.—Femora deep brown, with black hairs; remaining segments brighter brown, also with black hairs, except for short, orange-brown ones ventrally on tarsi.

Wings.—Edgings to the veins not much paler than the dark grey elsewhere, so the marbling is relatively inconspicuous; stigma dark brown; veins dark brown; R_4 somewhat angulate, and with an inconstant trace of an appendix; cell R_5 long-petiolate.

Abdomen.—Shining black, the first 2 tergites with a brownish hue; hairs black, except for greyish white ones on disc of 1st tergite, thinly in lateral areas, and quite densely on lateral margins and lateral parts of posterior edges of the remaining tergites. Venter blackish brown, with indications of paler apical edges to the sternites; hairs black in median zone, white elsewhere, especially at apices of sternites.

Distribution.—WESTERN AUSTRALIA: 13 miles NNE. of Bindoon, Oct., Calaby; Bullsbrook, Nov., Wilson; Perth (Swan R.) (Ricardo 1915*b*); Duggan, Oct., Calaby; Bowelling, Nov., McIntosh and Calaby; 8 miles NNW. of Kuringup, Nov., Calaby; 19 miles W. of Israelite Bay, Dec., Calaby; Mt. Barker, Clark.

SCAPTIA (PLINTHINA) SUBCINEREA, sp. nov.

Types.—Holotype ♀, from 13 miles E. of Pingrup, W.A., 1.xi.1953, J. H. Calaby, and allotype ♂, from sand plain, Dumbleyung, W.A., –.ix.1938, E. H. Kipps, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

Material examined.—1 ♂, 7 ♀♀.

A black species, with conspicuous scutal vittae, very short palpi, and long petiole to cell R_5. Superficially like *binotata*, but closer to *clelandi*, from which it is distinguished by its darker colour and uniformly shining black abdomen.

Female (Figs. 170, 179)

Head.—Hairs on eyes dark brown, with paler reflections laterally. Frons brown, with a darker patch in centre, a wide, fawn-grey strip along the eyes, and dark brown hairs; ocellar tubercle grey, with black hairs. Subcallus fawn-grey in centre and along eyes, dark brown elsewhere; parafacials and face irregularly brown and fawn-grey, with mainly black hairs, but a dense greyish white patch along lower half of parafacials. *Antennae*: 1st segment with grey tomentum and black hairs; 2nd brownish black, with a little grey tomentum and black hairs; 3rd brownish black, not so dark at extreme base. *Palpi*: 1st segment blackish, with white hairs below; 2nd very short, blunt, with a deep lateral concavity, deep brown, with short black hairs marginally. Beard white, with a few brown hairs at lower angle of parafacials.

Thorax.—Ground colour of scutum dark brown; a narrow median line, wider, conspicuous, dorsocentral lines, and wide lateral areas light grey, with a patch of brown laterally above wing root; the median and dorsocentral vittae tend to diffuse posteriorly in front of scutellum; hairs on disc black, mixed with white anteriorly, laterally, and diffusely in front of scutellum; hairs on notopleural lobes white, mixed with some black and creamy yellow; supra- and postalar tufts white, conspicuous. Scutellum dark brown laterally, greyish fawn centrally, with mainly black hairs, and a group of white ones marginally on each side of the paler area. Pleura dark grey to brown, with dense greyish white hairs everywhere, except for some black ones on lower part of mesopleural area.

Legs.—Coxae deep brown, with some greyish tomentum, and mixed black and white hairs; femora blackish brown, with black hairs, knees pale; remaining segments, particularly anterior and mid tibiae, not so dark, all with black hairs.

Wings.—More conspicuously marbled than in *cinerea*; stigma and veins deep to blackish brown; R_4 strongly curved or angulate, sometimes with definite appendix; petiole to cell R_5 long.

Abdomen.—Shining black; hairs black on central and posterior part of 2nd tergite and on discs of 3rd and subsequent tergites, greyish white on 1st and most of basal part of 2nd tergite, and with conspicuous, lateral, dense white fringe. Venter with predominantly white hairs on 1st and 2nd sternites, predominantly black more posteriorly.

Male

Similar to ♀, but more hairy. Eyes with upper facets not enlarged. Palpi rod-like, brown, with paler bare area, and long white hairs. Genitalia as in *clelandi*.

Distribution.—WESTERN AUSTRALIA: Eradu, Sept., Ferguson; near Watheroo, Oct., Calaby; "Cranmore Park", near Moora, Oct., Dec., Fuller; Dumbleyung, sand plain, Sept., Kipps; 13 miles E. of Pingrup, Nov., Calaby.

SCAPTIA (PLINTHINA) CLELANDI (Ferguson)

**Erephopsis clelandi* Ferguson, 1921*b*, p. 4. Type ♀, from Narrabri, N.S.W., in the Australian Museum, Sydney.

Osca (*Plinthina*) *clelandi* (Ferguson). Ferguson 1924, p. 256.

Scaptia (*Plinthina*) *clelandi* (Ferguson). Ferguson 1926*a*, p. 298; Mackerras 1955*a*, p. 497, fig. 31.

Material examined.—2 ♂, 22 ♀♀.

A brown species, with short, thick palpi, and long petiole to cell R_5; close to *subcinerea*, from which it is distinguished by its lighter general colour, brown legs, more brownish marbling of wings, and brown, fasciate abdomen. Length 10–13 mm.

Female (Figs. 34, 171, 174, 180; Plate 3, Fig. 25; Plate 4, Fig. 38)

Head.—Eyes with rich brown hairs, paler below. Frons more distinctly diverging than in other species of subgenus, brown, with a darker zone below centre, greyish fawn eye margins, and brown hairs; ocellar tubercle grey, with black hairs. Subcallus brown, greyish in mid-line, and more definitely at eye margins; parafacials and face brown, with brown hairs. *Antennae*: 1st and 2nd segments brown, with ashy tomentum and black hairs; 3rd dark reddish brown, paler at extreme base. Palpi brown, concavity deep, darker; hairs black, except for a white zone ventrally on 1st segment. Beard white.

Thorax.—Scutum brown, sublateral ground colour darker; median grey line evanescent, except anteriorly and posteriorly; dorsocentral vittae well defined, sublateral areas grey, well defined, with a brown spot above wing root; hairs brown on disc, white anteriorly and in front of the scutellum; hairs on notopleural lobe black, supra- and postalar tufts white, conspicuous. Scutellum brown laterally, greyish in median area, with black hairs. Pleura grey above, fawn-brown below; hairs long, dense, white, except for some black on upper and lower mesopleural areas.

Legs.—Femora and hind tibiae dark brown; remaining segments brighter brown, with black hairs, except for some short white ones on basal half of hind femora, and short yellowish to orange ventral hairs on fore tibiae and all tarsi.

Wings.—Marbling more brownish than in relatives; stigma dark brown; veins brown to yellowish brown; R_4 angulate, with strong appendix; cell R_5 long-petiolate.

Abdomen.—First and 2nd tergites yellowish brown, with an incomplete brown median vitta on 2nd; remainder darker, with dark brown basal bands; hairs black on most of disc, yellowish cream sublaterally on basal two-thirds of 1st and 2nd tergites, more creamy white in a dense lateral fringe. Venter dark greyish brown, with the base and apical margin of the 2nd and the apical margins of subsequent sternites light yellowish brown; hairs creamy white, mixed with some black in the median area.

Male (Figs. 34, 42, 171)

Similar to ♀, but more hairy, and more yellowish brown in general coloration. Eyes with upper facets only slightly enlarged, but the hairs distinctly divided into an upper brown and lower greyish white zone. Subcallus, parafacials, and face more prominent and paler than in ♀; 1st antennal segment slightly swollen; palpi slender, rod-like, with small apical dorsal concavity. Genitalia with coxites widened apically, but not wrinkled; hairs on style long, conspicuous.

I have seen one ♂ and one ♀ from Western Australia. The ♂, in the Berlin Museum, is normal. The ♀, from Boondi, is fresher than others I have seen, and is darker, more brightly marked, has the frons more extensively grey laterally, especially below, and the 8th sternite slightly wider than in eastern specimens.

Distribution.—QUEENSLAND: Eidsvold, biting cattle, Aug., M.J.M.; "Wetlands", near Augathella, Sept. NEW SOUTH WALES: Narrabri, Oct.; Coonabarabran, Oct., Wilson; "Calumet", 26 miles NE. of Binnaway, Nov., Musgrave; Gilgandra. WESTERN AUSTRALIA: 2 miles W. of Boondi, Sept., McIntosh and Calaby; "Marloo Station" (Berlin Museum).

Scaptia (Plinthina) vertebrata (Bigot)

**Erephropsis vertebrata* Bigot, 1892, p. 618 (lapsus); Ricardo 1900*a*, p. 112, 1915*b*, p. 22 (as syn. of *gibbula* Walker); Surcouf 1921, p. 121. Type ♀, from Australia, in the British Museum (Natural History).

Lilaea vertebrata (Bigot). Enderlein 1925, p. 297.

**Diatomineura carnea* Bigot, 1892, p. 619; Ricardo 1900*a*, p. 113, 1915*b*, p. 22 (as syn. of *gibbula* Walker); Surcouf 1921, p. 130. Type ♀, from Australia, in the British Museum (Natural History).

Scaptia carnea (Bigot). Enderlein 1925, p. 278.

This species remained unrecognized in Australian collections for many years, following Miss Ricardo's inexplicable synonymy with *gibbula*, an entirely different species belonging to the subgenus *Myioscaptia*.

Material examined.—5 ♂♂, 17 ♀♀.

A grey and brown species, with short palpi and short petiole to cell R_5. Distinguished from all other members of the subgenus by its clear, unmarbled wings, and tomentose, vittate, and fasciate abdomen. Length 10–13 mm.

Female (Figs. 172, 181; Plate 3, Fig. 26)

Head.—Eyes dark chocolate brown in life; with dense brown hairs above, longer, creamy white ventrolaterally. Frons diverging, creamy white, with a pair of small brown patches below middle, and with creamy yellow and some brown hairs; ocellar tubercle grey, with black hairs. Subcallus with light brown tomentum, showing silvery reflections; parafacials greyish white, with cream hairs on upper half, and black and a few white ones at lower margin; face greyish, with mixed black and creamy yellow to white hairs. *Antennae*: 1st segment with greyish cream tomentum, and cream and black hairs; 2nd darker, with black hairs; 3rd dark reddish brown. Palpi greyish fawn, lateral concavity deep, darker; hairs white to cream. Beard greyish white.

Thorax.—Scutum with ground colour dark brown, divided into four stripes by the pale grey median and wider dorsocentral vittae (Mackerras 1956*a*, Fig. 5*H*); grey lateral areas wide; submedian brown stripes widely interrupted by grey in the posterior half of the post-sutural area, and taken up again as a brown patch on each side in front of the scutellum; sublateral brown stripes interrupted by grey at the suture; and a small brown patch above the wing root. Hairs on disc mixed black and white, more definitely white on anterior margin and in front of scutellum; notopleural hairs mixed yellow-brown and black; supra- and postalar tufts white, conspicuous. Scutellum grey centrally, brown laterally, with black hairs. Pleura light grey, with a faint brownish tinge in places, and with dense greyish white hair tufts, mixed with brownish yellow on upper and posterior edges of upper mesopleural convexity.

Legs.—Fore and mid legs almost uniformly brown, hind dark brown to blackish; femora with greyish white hairs, other segments with predominantly black hairs.

Wings.—Clear, without darker pattern; stigma brown, relatively inconspicuous; veins brown; R_4 angulate, with or without appendix; cell R_5 rarely narrowly open, usually closed, short-petiolate.

Abdomen.—Light fawn-grey, tomentose; with narrow basal brown bands on the tergites, widening a little laterally, and greatly in the mid-line into triangular brown patches which form an irregular median vitta; 1st tergite with a median, transversely elongate, brown patch apically; 6th and subsequent tergites almost entirely grey; hairs black on the disc, but with a series of fairly prominent marginal white patches, underlying which the lateral corners of the tergites are yellowish. Sternites brownish grey, with dark cream apical margins, and predominantly white hairs.

Male (Fig. 172)

More hairy and more yellowish brown than ♀; upper facets of eyes not enlarged; palpi light yellowish brown, rod-like, with small apical dorsal pit.

Distribution.—QUEENSLAND: Han's Tableland, Aug., Wetherley; Mareeba, biting cattle, Aug.; Tinaroo Falls, biting, Aug., Wallis; Herberton, Aug., Wetherley; Spring Ck., Wondecla, Sept., Leask; 20 miles S. of Ingham, Sept., C. Lee; Rockhampton; Targinnie, Sept., Burns; Gladstone; Yarwun, Aug., Butler. NEW SOUTH WALES: "Calumet", 26 miles NE. of Binnaway, Nov., Musgrave; Blue Mts. (old specimens in Macleay Museum, locality doubtful).

VIII. Subgenus PALIMMECOMYIA Taylor

Palimmecomyia Taylor, 1917*b*, p. 518; Enderlein 1925, p. 405; Ferguson 1926*a*, p. 300; Mackerras 1955*a*, p. 498. Originally monotypic for *Palimmecomyia celaenospila* Taylor, 1917 (= *Pangonia walkeri* Newman, 1857), Queensland.

Female

Long (13–17 mm), narrow, parallel-sided species, with peculiar, waxy integument, and flavid, brown-tipped wings. Frons wide, slightly diverging, with a rudimentary callus in *walkeri*. Subcallus more projecting than in other subgenera. Face protuberant, shining. First antennal segment longer than in other subgenera. Proboscis and palpi as in subgenus *Pseudoscione*. Wing with cell R_5 closed or open; cell M_3 open. Eighth sternite with gonopophyses subtriangular; cerci rounded apically; lateral arms of furca fused with 9th tergite.

Male

Palpi as in subgenus *Plinthina*. Ninth tergite deeply incised distally; aedeagus and coxite normal; style hooked and pointed at tip, but not unusually wide, nor with zone of conspicuous hairs.

There are two species. Both are rare, and there are no recent specimens in collections. Nothing is recorded of their habits, the life history is unknown, and our knowledge of their distribution is fragmentary.

KEY TO SPECIES OF THE SUBGENUS PALIMMECOMYIA

Females

Discal cell of wing not sharply marked off; basal segments of antennae, face, and palpi dark to blackish brown. Eastern Australia	*walkeri* (Newm.)
Discal cell strongly margined with brown; basal segments of antennae and palpi yellow, face light brown. South or Western Australia	*pictipennis*, sp. nov.

SCAPTIA (PALIMMECOMYIA) WALKERI (Newman)

Pangonia walkeri Newman, 1857, p. 56; Surcouf 1921, p. 129 (as *Pangonius*). Type, sex not indicated, from Moreton Bay, S. Qld., stated to be in the Gibbon Collection.

Palimmecomyia walkeri (Newman). Ferguson and Hill 1922, p. 249; Ferguson 1926*a*, p. 300, fig. 12.

Lilaea walkeri (Newman). Enderlein 1925, p. 297.

Scaptia (*Palimmecomyia*) *walkeri* (Newman). Mackerras 1955*a*, p. 498, fig. 32.

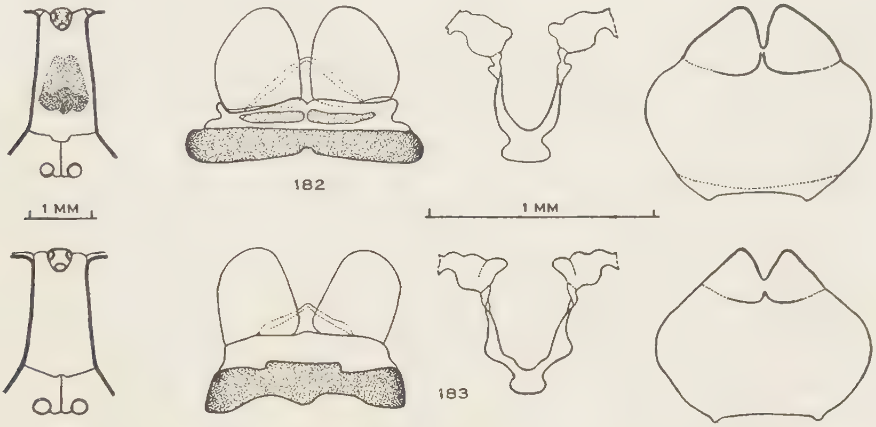
**Palimmecomyia celaenospila* Taylor, 1917*b*, p. 518; Ferguson and Hill 1922, p. 249 (syn. of *walkeri* Newman). Type ♂, from Brisbane, September, Hacker, in the Queensland Museum.

Material examined.—2 ♂♂, 4 ♀♀.

A narrow-bodied, parallel-sided species; with dark to blackish brown basal antennal segments and face; bright brown scutum; yellowish wings tipped with brown; yellow abdominal tergites, marked with patches of black; and blackish pleura and venter. Length 16–17 mm.

Female (Figs. 35, 182; Plate 3, Fig. 27)

Head.—Eyes with light brown hairs, paler below and on margins. Frons diverging, greyish fawn, with dull yellowish cream hairs, and an irregular, shining, dark reddish brown callus; ocellar tubercle raised, grey, with dull yellowish cream hairs. Subcallus prominent, greyish, creamy fawn around eyes, without hairs; parafacials light greyish fawn on eye margins, dark brown, somewhat shiny, and with greyish cream hairs below; face protuberant, shining dark brown, with ashy hairs laterally. *Antennae*: 1st segment about twice as long as wide, 2nd small, both dark to blackish brown, with greyish cream hairs and a few black ones; 3rd bright orange, darker at base. *Palpi*: 1st segment dark to blackish brown, with short ashy hairs; 2nd dark brown marginally, brighter to reddish brown in the broad, deeply concave bare area. Beard pale greyish cream.



Figs. 182, 183.—Subgenus *Palimmecomyia*, frons and female genitalia. 182, *walkeri* (Newm.); 183, *pictipennis*, sp. nov.

Thorax.—Scutum bright brown with a yellowish tinge, rather shining, with indications of very narrow, yellowish dorsocentral lines, and with pale creamy gold hairs on disc; pronotal lobes creamy yellow, with bright yellow hairs; notopleural lobes darker, with predominantly mustard yellow hairs, but some yellowish cream ones below and posteriorly; supra- and postalar tufts creamy yellow. Scutellum black, shining, with sparse yellow hairs. Pleura black, with a dense, bright yellow propleural tuft, a group of brown hairs on the prosternum, brown on the upper part of the postmesopleural tuft, and creamy yellow squamal tuft, the remaining hairs ashy.

Legs.—Femora black, with greyish to yellowish cream hairs. Fore and mid tibiae reddish brown basally, blackish brown on apical fifth; tarsi blackish brown, apices of the segments bright yellowish brown. Hind tibiae and tarsi more extensively blackish brown than the others. Hairs on all these segments short, dense, greyish cream.

Wings.—Greyish, suffused with yellow on anterior half, and with yellowish to bright brownish yellow veins; stigma yellowish brown; a distinct brown patch at apex, extending from the tip of R_{2+3} to the fork of R_{4+5} and the tip of R_5. Vein R_4 with a small, inconstant appendix; cell R_5 closed, short-petiolate.

Abdomen.—Rather shining waxy yellow, covered with bright golden hairs, which are densest and form vague golden bands at the apices of the tergites. The dorsum is also marked with the following dark brown patches, which are covered with brown and some golden hairs: a rounded median patch at the base of the 1st tergite; an elongate, tapering one extending from the base nearly to the apex of the 2nd; a trace of a median patch on the 3rd, and lateral patches on the basal two-thirds of the first 4 tergites. Venter shining black, but with apical two-thirds of the 1st sternite yellowish cream; hairs ashy, densest in apical fringes to the sternites.

Male (Figs. 35, 44)

Similar to ♀, but somewhat more hairy. Eyes with upper facets slightly larger than the lower, but without any clear line of demarcation; hairs long and dense, brownish yellow on larger facets, yellowish cream elsewhere. First segment of antennae more swollen than in ♀. Palpi rod-like, the 2nd segment blackish brown, with orange-brown apical concavity. Wing with cell R_5 open.

Distribution.—QUEENSLAND: Chinchilla, Sept.; Brisbane, Sept., Hacker; Moreton Bay (Gibbon). NEW SOUTH WALES: Grafton, Sept.; Warrah, Froggatt; Port Stephens; Temora; Warren.

SCAPTIA (PALIMMECOMYIA) PICTIPENNIS, sp. nov.

Palimmecomyia pictipennis Ferguson, ms.

Type.—Holotype ♀, from South Australia, no details, in the Macleay Museum, University of Sydney.

Material examined.—2 ♀♀.

A more yellowish species than *walkeri*; with yellowish frons, basal segments of antennae, palpi, and legs; yellowish abdomen, with the 2nd tergite entirely blackish brown; and the discal cell of the wing strongly margined with brown. Length 13–16 mm.

Female (Fig. 183; Plate 4, Fig. 39)

Head.—Hairs on eyes short, dense, brownish above, golden below. Frons yellow, with dull golden to yellowish brown hairs; no callus; ocellar tubercle moderately raised, light greyish fawn. Subcallus yellow, with a creamy tint above; parafacials yellowish, with golden hairs; face shining, brownish yellow, with a few dark hairs on either side. Basal segments of antennae bright yellowish, with golden hairs, 1st not as long or as swollen as in *walkeri*; 3rd missing. Palpi shaped as in *walkeri*, bright orange-yellow, with short golden hairs. Beard dull golden.

Thorax.—Scutum brownish yellow, with traces of narrow, paler dorsocentral lines, and with light golden hairs; notopleural hairs brownish gold; supra- and postalar tufts creamy gold. Scutellum brownish black, with sparse, dull golden hairs. Pleura brownish black, with a dark golden propleural tuft in front of the spiracle as in *walkeri*, but remaining hairs, except part of hypopleural tuft and squamal tuft, dark brown to blackish.

Legs.—Fore femora brownish yellow, mid and hind dark brown basally, becoming yellowish on the apical third. Tibiae and tarsi bright yellow, with golden hairs.

Wings.—Yellowish anteriorly, as in *walkeri*, and with the anterior veins yellow, but the distal parts, except for Cu_1, brown; the brown apical patch extends posteriorly at least as far as M_4, and there are indications of clearer areas in the centres of some of the cells; discal cell strongly margined with brown. Vein R_4 with a variable appendix, strong on both sides in the holotype; cell R_5 closed, petiolate.

Abdomen.—First tergite pale yellow, with golden hairs, but somewhat darkened in the median line; 2nd blackish brown, paler along apical margin, and covered with dark brown to blackish hairs; remaining tergites brownish yellow, with short, dense, golden hairs. Venter shining black, with dark hairs, except for a variable amount of bright brownish yellow on the apical sternites, the 6th and 7th in the holotype being almost entirely pale.

Distribution.—SOUTH AUSTRALIA: no details. WESTERN AUSTRALIA: Ferguson's notes record a specimen from the Darling Range; I have not seen it, unless it is the ♀ without locality label, which is now in the School of Public Health and Tropical Medicine, University of Sydney. Neither record can be accepted unreservedly until more specimens are discovered.

IX. Tribe PANGONIINI

The types of all but one of the described Australian species have now been examined. All were correctly recorded in Part II (Mackerras 1956*b*), except that the three cotype ♂♂ of *Pangonia brevipalpis* Macquart, 1847, are in the British Museum, not Paris, and *Ommia prisca* Enderlein, 1925, was misidentified. C. B. Philip (personal communication) has seen the type ♀ of *Pangonia aurofasciata* Jaennicke, 1867, in the Frankfurt Museum, and reported that it is in poor condition, but the synonymy is apparently correct.

ECTENOPSIS (ECTENOPSIS) ERRATICA (Walker)

**Tabanus erraticus* Walker, 1848, p. 189. Type ♂, from New Holland, in the British Museum (Natural History).

?*Corizoneura erratica* (Walker). Ricardo 1900*a*, pp. 113, 121; Surcouf 1921, p. 134; Enderlein 1925, p. 271.

This species has not been recognized previously in Australia. The type proved to be a black species of *Ectenopsis*, and a recent ♂ from the collection of Mr. A. N. Burns was found by Mr. Oldroyd to agree with it.

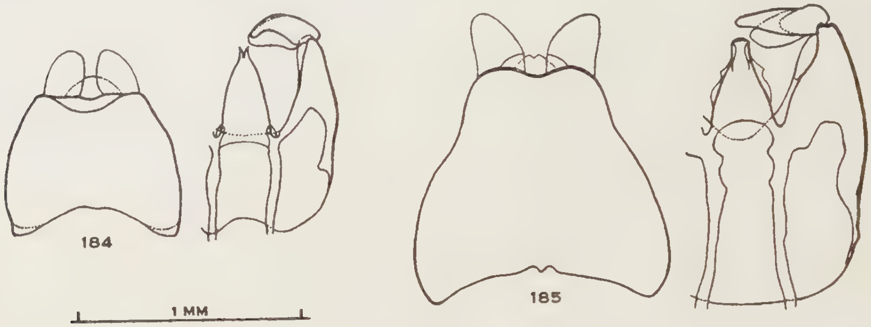
A black, shiny species, with hairy face, short palpi, brown wings, and narrow, pale, apical bands and median and lateral triangles on abdominal tergites. Length 11 mm. Distinguished from *E. occidentalis* Mack. by its darker colour, and normal antennae and genitalia.

Male (Fig. 184)

Head.—Eyes bare, meeting in centre of frons; upper facets only slightly enlarged, but perceptibly differentiated from the small lower and marginal facets. Ocellar tubercle prominent, grey; frontal triangle small, grey; subcallus brown, grey at margins; parafacials grey, face more brown, both with long, dense, black hairs. *Antennae*: 1st and 2nd segments dark brown to blackish, with short black hairs; 3rd brown. Palpi dark grey, with long black hairs. Proboscis relatively long and slender; labella about one-third total length. Beard black anteriorly, ashy posteriorly.

Thorax.—Scutum shining black, with wide ashy dorsocentral vittae, which are markedly narrowed at suture; hairs black. Scutellum shining black, with faint ashy overlay laterally, and black hairs. Pleura dark grey, except for pale creamy grey prothoracic region; hairs black on upper mesopleural convexity, cream to greyish elsewhere.

Legs.—Coxae as pleura; remaining segments dark brown, yellow-brown at articulations, and with predominantly black hairs.



Figs. 184, 185.—Pangoniini, male genitalia. 184, *Ectenopsis* (*Ectenopsis*) *erratica* (Walk.); 185, *Caenoprosopon dycei*, sp. nov.

Wings.—Brownish, with dark brown costal cell, elongate, blackish brown stigma, black veins, and narrow suffusion of dark brown along veins in basal half; R_4 rectangular at base, with short, strong appendix.

Abdomen.—Black dorsally, with thin ashy overlay on 1st tergite, and narrow, light grey apical bands and median and lateral triangles on all visible tergites; hairs black, inconspicuous, except for a zone of cream hairs at sides of 1st tergite. Venter black, with grey overlay, and black hairs, except for cream ones laterally on 1st and 2nd sternites. Genitalia (Fig. 184) normal for the subgenus.

Distribution.—WESTERN AUSTRALIA: Bunbury, Jan., A. Snell.

Ectenopsis (Parasilvius) victoriensis Ferguson

Ommia prisca Ferguson, 1926*a*, p. 305; Mackerras 1956*b*, p. 431; nec Enderlein, 1925, p. 339. Enderlein's type ♀, received through the kindness of Professor Peus, proved to be a specimen of *Mesomyia* (*Lilaea*) *lurida* (Walker), Chrysopinae. His names are therefore deleted from the synonymy of *Parasilvius* and *P. victoriensis* respectively.

A freshly caught ♀, from Ngallo, near Murrayville, Vic., attracted to man, 18.ii.1956, G. W. Douglas, is considerably darker than the old female previously described (though not as dark as *E.* (*P.*) *fusca* Mack.), has shorter palpi, and the pale apical triangles on 2nd and 3rd abdominal tergites produced to form a narrow median vitta. It agrees well in other respects, and is a further illustration of the caution that is necessary in interpreting descriptions of coloration.

The locality is in the far north-west of Victoria, in the area where females had been taken previously.

CAENOPROSOPON DYCEI, sp. nov.

Type.—Holotype ♂, from Colo Vale, N.S.W., 24.ii.1958, A. L. Dyce, in the Division of Entomology Museum, C.S.I.R.O., Canberra.

A striking, rather dark, dull brown species; with upper facets of eyes distinctly enlarged; scutum vittate; legs brown; wings dark greyish brown, with clear areas posteriorly; and abdominal tergites with blackish brown median and lateral spots. Length 15 mm.

Male (Fig. 185; Plate 4, Fig. 40)

Head.—Eyes blackish (dark greenish brown when partly relaxed); upper large facets merging into small, lower and posterior facets, which extend up the occipital margin, but do not reach vertex. Ocellar tubercle black, prominent, with long black hairs; frontal triangle, subcallus, parafacials, and face brown, the parafacials and face with long black hairs. *Antennae*: 1st and 2nd segments brown, with some greyish tomentum, and long black hairs; 3rd very slender, obscurely 7–8 annulate, brownish yellow, with apical annulus blackish. Palpi brown, with black hairs; 2nd segment slender, of uniform thickness, with rounded tip. Proboscis slender, less than head height, brown, with darker labella. Beard dull cream, with some black hairs laterally.

Thorax.—Scutum brown, with yellowish to greyish fawn admedian lines, dorsocentral lines, humeral lobes, suture, and postalar areas; the admedian lines end at suture, and the dorsocentral lines widen behind it and almost fuse in front of scutellum; notopleural lobes brown, and a blackish brown band on lateral margin from humeral lobe to wing root; hairs long, dull cream, mixed with brown. Scutellum yellowish brown, with long, silky, cream hairs. Pleura brown, with predominantly creamy white hairs, mixed with a few black ones on lower part of upper mesopleural convexity.

Legs.—Almost uniformly brown; coxae and mid and hind femora with predominantly whitish hairs, remaining segments with predominantly black hairs.

Wings (Plate 4, Fig. 40).—Greyish brown, more yellowish in costal and anterior radial cells, darker across apices of basal and discal cells and at fork of R_{4+5}, vaguely paler in most cells, and with clearer areas in distal half of discal cell, 2nd basal cell, and behind Cu_1. Veins yellowish anteriorly, brown in middle section and along Cu_1; R_4 with short appendix; a short spur projecting forwards from M_3 into discal cell in both wings; cells R_5 and M_3 widely open. Squames light yellowish, with creamy white fringe and tuft. Halteres with light fawn stem, brown knobs.

Abdomen.—Predominantly dull, rather deep brown, with overlay of paler greyish brown tomentum sublaterally on 1st and 2nd tergites, median blackish brown patches on 2nd to 4th, and rounded, blackish brown spots almost filling lateral margins of 1st to 5th; apical edges of tergites very narrowly pale; hairs long, predominantly creamy white, but black on apical segments. Venter brown, with dense, light greyish overlay on first 6 sternites, more brownish on 7th, and narrow, pale, apical margins from 2nd to 5th; hairs silvery white, except for some dark ones at apex. Genitalia as in Figure 185.

Distribution.—NEW SOUTH WALES: Colo Vale, Feb., Dyce.

This species is related to *C. trichocerus* (Big.), from which it is distinguished by darker general colouring, and the patterns of the wings and abdomen. It falls between the two halves of caption 1 of the key already published (Mackerras 1956*b*, p. 436), but is less discordant in the first half than the second.

X. EXCLUDED SPECIES

The following species are excluded from the Australian Pangoniinae:

**Diatomineura cydister* Taylor, 1918, p. 58. Type ♂, from Western Australia, in the Australian Museum, Sydney. A *Mesomyia* (*Mesomyia*), Chrysopinae.

**Diatomineura nigricornis* Bigot, 1892, p. 614. Type ♀, from "Australie" (erroneous), in the British Museum (Natural History). Not a synonym of *Scaptia* (*Scaptia*) *plana* (Walker), as stated by Ricardo (1915*b*), but of *Philoliche lateralis* (Fabricius), Africa, by comparison with specimens in the British Museum.

**Pangonia dorsalis* Macquart, 1838, p. 100, nec Latreille, 1812. Type ♂, from "Nouvelle Hollande" (erroneous), in the Paris Museum. A synonym of *Philoliche neocaledonica* (Mégnin), New Caledonia (Mackerras and Rageau 1958, p. 699).

**Pangonia fulviventris* Macquart, 1838, p. 109. Type ♂, without locality label, in the Paris Museum. It was described from unknown country, but listed as from Australia by Ricardo (1900*a*). Ferguson and Hill (1922) considered that there was no evidence that this was correct. The type, in fairly good condition, proved to be identical with the Palaearctic **Pangonius flavus* Meigen (= *ferrugineus* Latreille).

**Pangonia gemella* Walker, 1848, p. 139. Type ♀, from Perth, G. Clifton, in the British Museum (Natural History). A *Dasybasis*, Tabaninae (Mackerras 1959, p. 181).

XI. ACKNOWLEDGMENTS

In addition to the indebtedness already acknowledged (Mackerras 1956*a*, pp. 400–1), I would like to express my gratitude to Mr. H. Oldroyd, British Museum (Natural History), and Professor E. Séguy, Muséum National d'Histoire Naturelle, Paris, for providing facilities for me to work in their institutions; and to Professor F. Peus, Zoologisches Museum, Berlin, and Dr. Max Beier, Naturhistorisches Museum, Vienna, for the loan of types and other important specimens. Their cooperation has given the taxonomic part of these papers a precision that it could not otherwise have had. Dr. Dorothy Hill, Department of Geology, University of Queensland, has given indispensable guidance in the geological part of the discussion. I am grateful, too, to the Linnean Society of N.S.W. for permission to publish Figures 7–18 from papers by Miss K. M. I. English and the late Mary Fuller, and to the Yale University Press, U.S.A., for permission to use Figure 25 from Daly (1934).

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EXPLANATION OF PLATES 1–4

PLATE 1

Figs. 1–5.—*Scaptia*, subgenus *Scaptia*. 1, *pulchra* (Ric.), ♀; 2, *aurata* (Macq.), ♀; 3, *auriflua* (Don.), ♂ ♀; 4, *patula* (Walk.), northern, ♂ ♀; 5, *patula*, southern, ♂ ♀.

Figs. 6–7.—Subgenus *Pseudoscione*. 6, *maculiventris* (Westw.), ♀; 7, *lasiophthalma* (Macq.), ♀.

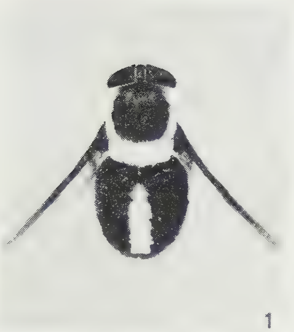
PLATE 2

Heads of females in profile

Figs. 8–11.—Subgenus *Scaptia*. 8, *singularis* (Macq.); 9, *berylensis* (Ric.); 10, *aurata* (Macq.); 11, *jacksonii* (Macq.).

Figs. 12–19.—Subgenus *Pseudoscione*. 12, *orientalis*, sp. nov.; 13, *vicina* (Tayl.); 14, *subappendiculata* (Macq.); 15, *regis-georgii* (Tayl.); 16, *maculiventris* (Westw.); 17, *xanthopilis* (Ferg.); 18, *subcontigua* (Ferg.); 19, *neoconcolor*, sp. nov.

THE TABANIDAE (DIPTERA) OF AUSTRALIA. III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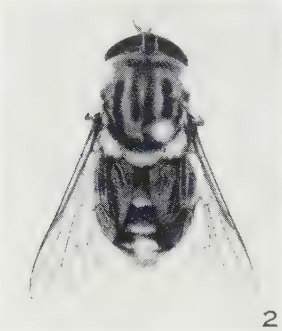
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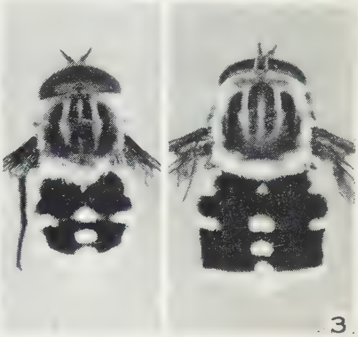
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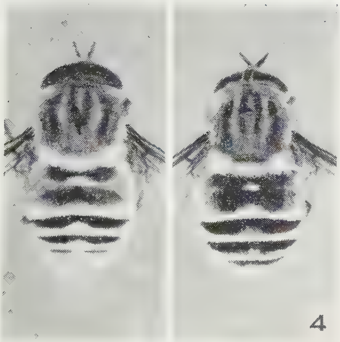
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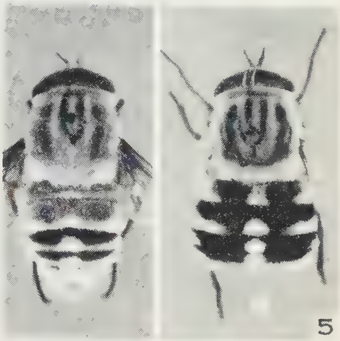
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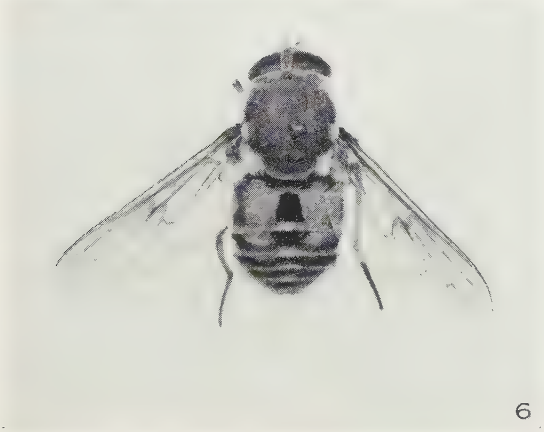
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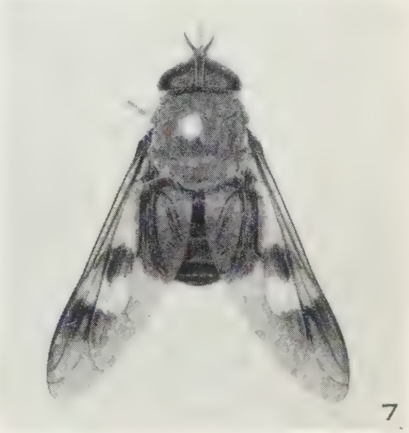
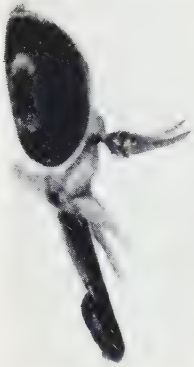

7

THE TABANIDAE (DIPTERA) OF AUSTRALIA. III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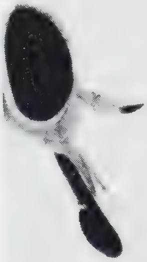
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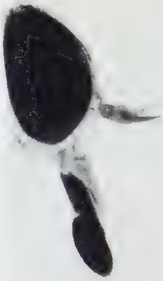
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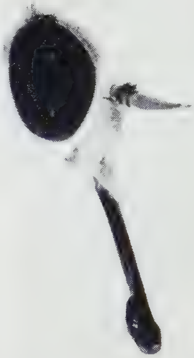
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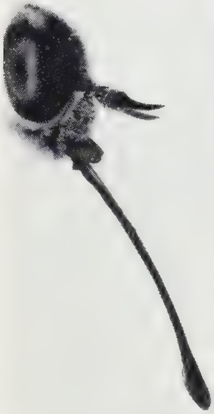
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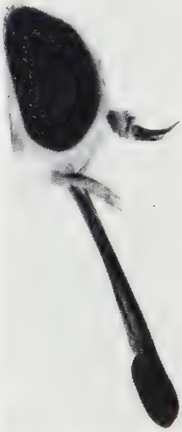
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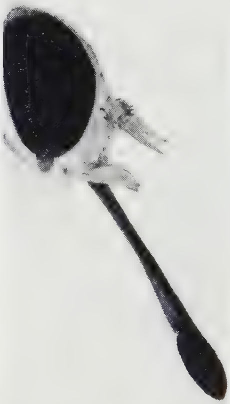
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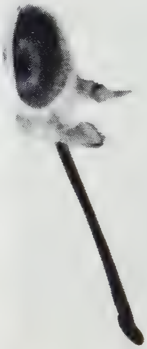
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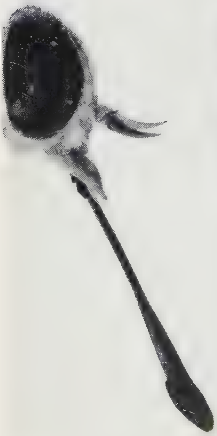
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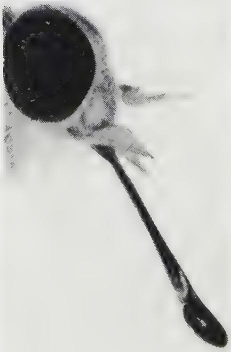
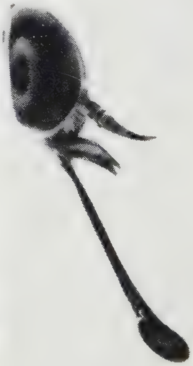

17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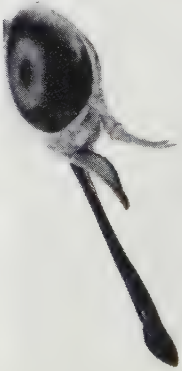
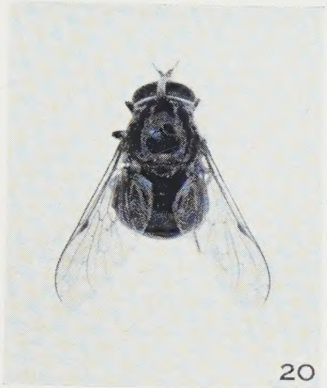

19

THE TABANIDAE (DIPTERA) OF AUSTRALIA. III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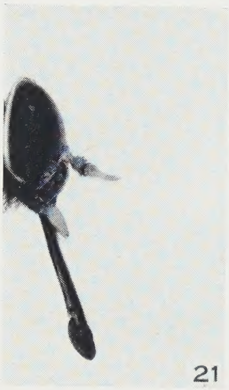
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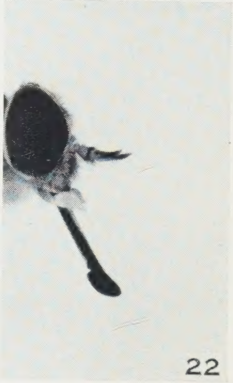
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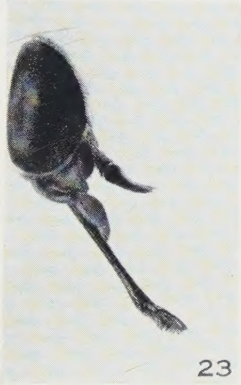
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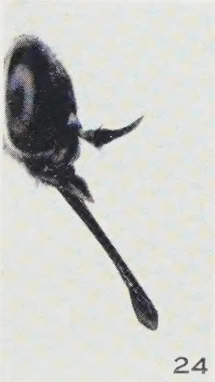
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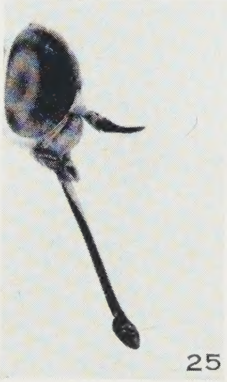
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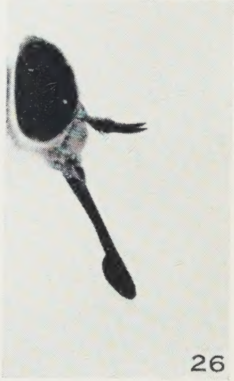

26

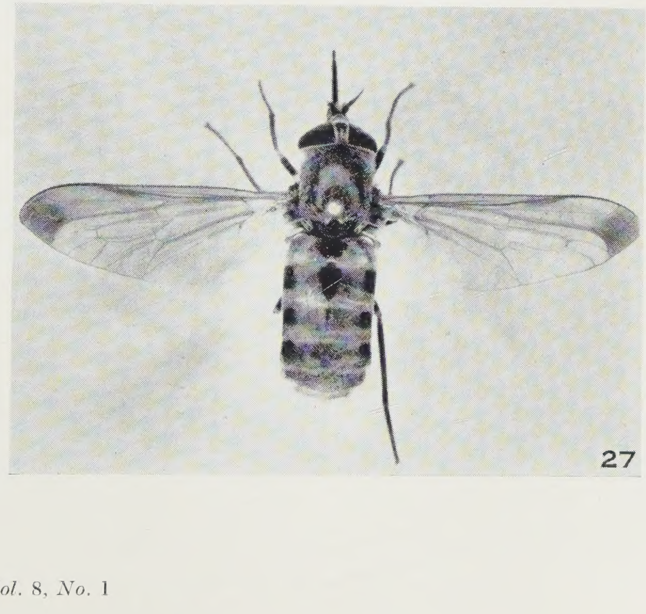
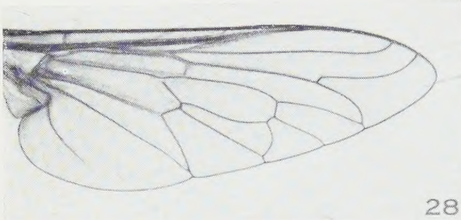
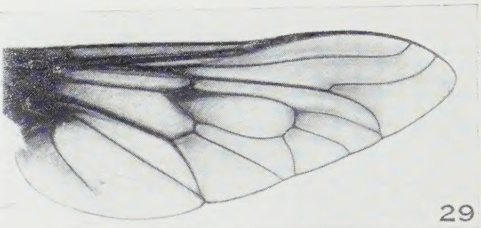

27

PLATE 4

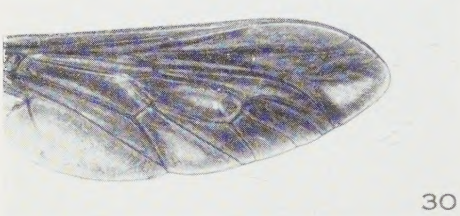
THE TABANIDAE (DIPTERA) OF AUSTRALIA. III



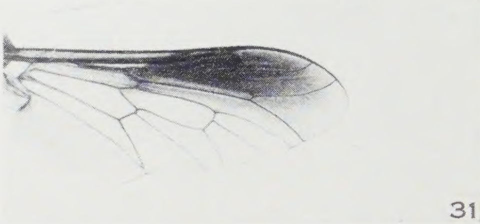
28



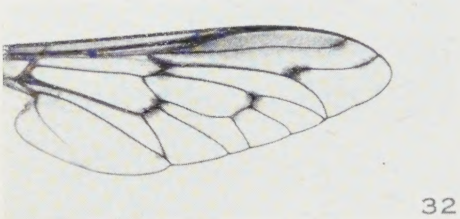
29



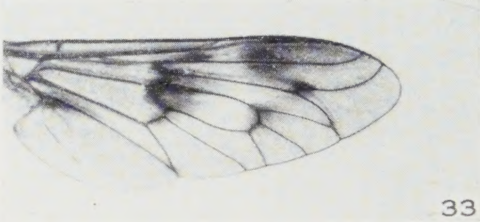
30



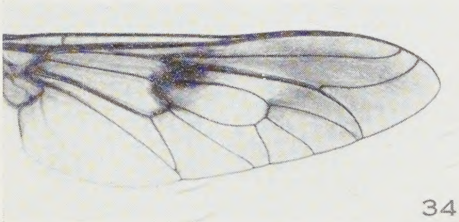
31



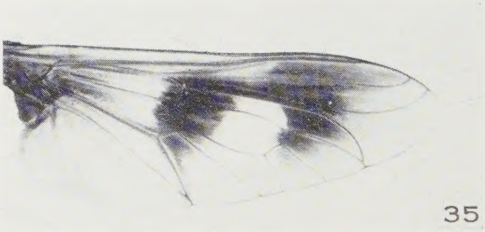
32



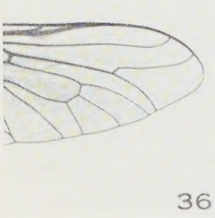
33



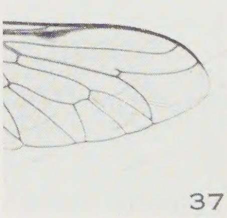
34



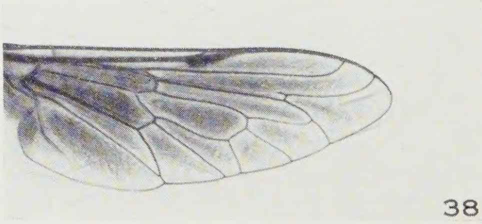
35



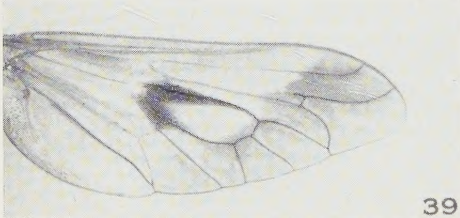
36



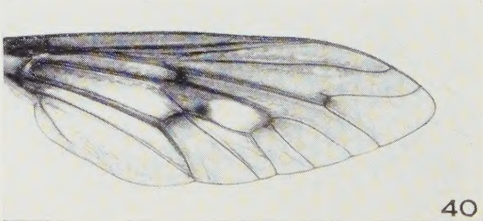
37



38



39



40

PLATE 3

Figs. 20–22.—Subgenus *Myioscaptia*, females. 20, *violacea* (Macq.), dorsal view; 21, *violacea*, profile of head; 22, *bancrofti* (Aust.).

Figs. 23–26.—Subgenus *Plinthina*, profiles of heads, females. 23, *binotata* (Latr.); 24, *divisa* (Walk.); 25, *clelandi* (Ferg.); 26, *vertebrata* (Big.).

Fig. 27.—*Scaptia* (*Palimmecomyia*) *walkeri* (Newm.), ♀.

PLATE 4

Figs. 28–39.—Wings of females. 28, *S.* (*S.*) *singularis* (Macq.); 29, *S.* (*S.*) *guttata* (Don.); 30, *S.* (*S.*) *aurinotum*, sp. nov.; 31, *S.* (*S.*) *berylensis* (Ric.); 32, *S.* (*S.*) *tricolor* (Walk.); 33, *S.* (*Ps.*) *neotricolor* (Tayl.); 34, *S.* (*Ps.*) *subcontigua* (Ferg.); 35, *S.* (*Ps.*) *quadrimacula* (Walk.); 36, *S.* (*M.*) *bancrofti* (Aust.); 37, *S.* (*M.*) *calliphora*, sp. nov.; 38, *S.* (*Pl.*) *clelandi* (Ferg.); 39, *S.* (*Pal.*) *pictipennis*, sp. nov.

Fig. 40.—*Caenoprosopon dycei*, sp. nov., ♂, Pangoniini.

INDEX OF GENERIC AND SPECIFIC NAMES

Valid names in italics, synonyms in Roman type

Page
abdominalis Ricardo 79
albicostata Macquart 69
albilateralis Macquart 69
albonotata Macquart 44
alpina, subsp. nov. 67
anomala, sp. nov. 118
anthracina Macquart 50
aperta Loew 92
Apocampta Schiner 36
Astypia Enderlein 81
auranticula, sp. nov. 54
aurata Macquart 58
aureohirta Ricardo 116
aureovestita Ferguson & Henry 46
auriflua Donovan 62
aurinotum, sp. nov. 49
auripleura Taylor 103
aurofasciata Jaennicke 145

bancrofti Austen 124
barbara, sp. nov. 48
barbata Walker 100
berylensis Ricardo 53
bicolor Macquart 101
bicolorata Taylor 106
bifasciata Enderlein 117
bifasciatus Macquart 44
binotata Latreille 134
brevipalpis Macquart (*Austroplex*) .. 145
brevirostris Macquart 56

calabyi, sp. nov. 106
calliphora, sp. nov. 126
carnea Bigot 140

Page
celaenospila Taylor 142
cinerea Ricardo 137
Clanis Walker 81
clavata Macquart 87
clelandi Ferguson 139
concolor Walker 114
conjugens Walker 73
conspicua Ricardo 117
constans Walker 70
contigua Walker 111
Copidapha Enderlein 81
crassa Walker 58
crocea Taylor 53
cydister Taylor (*Mesomyia*) 148

Diatomineura Rondani 3
dilatata Jaennicke 44
dives Macquart 62
divisa Walker 132
doddi Ricardo 90
dorsalis Macquart 148
dorsomaculata Macquart 100
dycei, sp. nov. (*Caenoprosopon*) 147

Erephopsis Rondani 3
erratica Walker (*Ectenopsis*) 145

fulgida Ferguson & Henry 74
fuliginosa Walker 111
fulvifascia Walker 70
fulviventris Macquart 148

gagatina Bigot 50
gemella Walker (*Dasybasis*) 148

Page

gemina Walker 90
georgii Taylor 104
gibbula Walker 127
guttata Donovan 43
guttipennis Ferguson 97

hardyi, subsp. nov. 69

ianthina White 121
inflata Ricardo 93

jacksoniensis Guérin 75
jacksonii Macquart 69

lasiophthalma Macquart 111
Lilaea Enderlein 81
limbinevris Macquart 45
limbithorax Macquart 47
longipennis Ricardo (Neotropical) .. 4

macroporum Macquart 134
maculipennis Macquart 111
maculiventris Westwood 101
margaratifera Wiedemann 43
media Walker 45
melas Bigot 50
minima Ricardo 50
minuscula, sp. nov. 52
montana Ricardo 80
monticola, nom. nov. 80
muscula English 130
Myioscaptia Mackerras 122

neoconcolor, sp. nov. 115
neotricolor Taylor 95
nigerrima, sp. nov. 135
nigra Schiner 50
nigricornis Bigot 148
nigroapicalis, sp. nov. 129
nigrocincta, sp. nov. 128
nitescens Walker 59
niveovittata Ferguson & Henry .. 47
norrisi, sp. nov. 49

occidentalis, subsp. nov. 99
Ommia Enderlein 146
orba, sp. nov. 55

Page

orientalis, sp. nov. 89
Osca Walker 3

Palimmecomyia Taylor 142
Pangonia Rondani 3
patula Walker 65
pictipennis, sp. nov. 144
plana Walker 72
Plinthina Walker 131
prisca Ferguson 146
Pseudoscione Lutz, Araujo, & Fonseca .. 81
pulchra Ricardo 58

quadrimacula Walker 113

regis-georgii Taylor 94
roei Macleay 117
ruficornis Macquart 69
rufonigra Ferguson 110

Scaptia Walker 3, 36
Scaptiella Enderlein 81
similis, sp. nov. 77
singularis Macquart 41
solida Walker 62
subappendiculata Macquart 92
subcana Walker 50
subcinerea, sp. nov. 138
subcontigua Ferguson 109
submacula Walker 41
submedia Ferguson 41

testacea Macquart 78
testaceomaculata Macquart 100
Triclista Enderlein 36
tricolor Walker 73

vertebrata Bigot 140
vicina Taylor 91
victoriensis Ferguson (*Parasilvius*) .. 146
violacea Macquart 123

walkeri Newman 142

xanthopilis Ferguson 108